

Exhibit E

(REDACTED VERSION OF
DOCUMENT TO BE SEALED)

Exhibit 37

(Submitted Under Seal)

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN

JASON COUNTS, et al.,)
individually, and on behalf)
of THEMSLEVES AND ALL) C.A. No.
OTHERS similary situated,) 1:16-cv-12541-TLL-PTM
Plaintiffs,)
vs.)
GENERAL MOTORS LLC, ROBERT)
BOSCH GMBH, and ROBERT)
BOSCH LLC,)
Defendants.)

The videotaped videoconference deposition
of KIRILL LEVCHENKO, Ph.D., called for examination
pursuant to the Rules of Civil Procedure for the
United States District Courts pertaining to the
taking of depositions, taken on the 19th day of
May, 2020, at the hour of 9:05 a.m.

* * * HIGHLY CONFIDENTIAL * * *

Reported by: Gina M. Luordo, CSR, RPR, CRR

License No.: 084-004143

APPEARING REMOTELY FROM COOK COUNTY, ILLINOIS

KIRILL LEVCHENKO, PH.D., CONFIDENTIAL

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<p>1 REMOTE APPEARANCES</p> <p>2 HAGENS BERMAN SOBOL SHAPIRO LLP</p> <p>3 BY: MR. PETER A. SHAEFFER</p> <p>4 455 North Cityfront Plaza Drive</p> <p>5 Suite 2410</p> <p>6 Chicago, Illinois 60611</p> <p>7 (708) 628-4949</p> <p>8 petersh@hbsslaw.com</p> <p>9 - and -</p> <p>10 CARELLA, BYRNE, CECCHI, OLSTEIN, BRODY &</p> <p>11 AGNELLO, PC</p> <p>12 BY: MR. JAMES E. CECCHI</p> <p>13 5 Becker Farm Road</p> <p>14 Roseland, New Jersey 07068</p> <p>15 (973) 994-1700</p> <p>16 jcecchi@carellabyrne.com</p> <p>17 - and -</p> <p>18 SEEGER WEISS LLP</p> <p>19 BY: MR. CHRISTOPHER AYERS</p> <p>20 55 Challenger Road, 6th Floor</p> <p>21 Ridgefield Park, New Jersey 07660</p> <p>22 (973) 639-9100</p> <p>23 cayers@seegerweiss.com</p> <p>24 - and -</p> <p>25 McQUADE BLASKO</p> <p>BY: MR. STEVEN S. HURVITZ</p> <p>811 University Drive</p> <p>State College, Pennsylvania 16801</p> <p>(814) 238-4926</p> <p>sshurvitz@mqlaw.com</p> <p>Representing the Plaintiffs;</p>	<p>1 INDEX</p> <p>2 WITNESS EXAMINATION</p> <p>3 KIRILL LEVCHENKO, Ph.D.</p> <p>4 By Mr. Work-Dembowski 6</p> <p>5 By Ms. Smith 227</p> <p>6</p> <p>7 EXHIBITS</p> <p>8 NUMBER IDENTIFICATION PAGE</p> <p>9 Exhibit 1 Expert Report of Kirill 15</p> <p>10 Levchenko October 28,</p> <p>11 2019</p> <p>12 Exhibit 2 Supplemental Expert Report 18</p> <p>13 Of Kirill Levchenko</p> <p>14 February 5, 2020</p> <p>15 Exhibit 3 Verdict and Settlement 35</p> <p>16 Summary</p> <p>17 Exhibit 4 Levchenko v. DCI Resorts, 36</p> <p>18 Inc. Case Summary</p> <p>19 Exhibit 5 Profile Page 70</p> <p>20 Exhibit 6 How They Did it: An 112</p> <p>21 Analysis of Emission</p> <p>22 Defeat Devices in</p> <p>23 Modern Automobiles</p> <p>24 Exhibit 7 E-mail Chain 187</p> <p>25 Exhibit 8 Software Documentation 207</p>
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<p>1 REMOTE APPEARANCES (continued):</p> <p>2 KIRKLAND & ELLIS LLP</p> <p>3 BY: MS. RENEE D. SMITH</p> <p>4 MR. JEFFREY S. BRAMSON</p> <p>5 300 North LaSalle Street</p> <p>6 Chicago, Illinois 60654</p> <p>7 (312) 862-2000</p> <p>8 renee.smith@kirkland.com</p> <p>9 jeffrey.bramson@kirkland.com</p> <p>10 - and -</p> <p>11 DYKEMA GOSSETT PLLC</p> <p>12 BY: MR. MICHAEL P. COONEY</p> <p>13 400 Renaissance Center</p> <p>14 Detroit, Michigan 48243</p> <p>15 (313) 568-6955</p> <p>16 mcooney@dykema.com</p> <p>17 Representing General Motors LLC;</p> <p>18</p> <p>19 CLEARY GOTTlieb STEEN & HAMILTON LLP</p> <p>20 BY: LARRY C. WORK-DEMBOWSKI</p> <p>21 2112 Pennsylvania Avenue, NW</p> <p>22 Washington, DC 20037</p> <p>23 (202) 974-1588</p> <p>24 lwork-dembowski@cgsh.com</p> <p>25 Representing Robert Bosch GMBH and</p> <p>Robert Bosch LLC.</p> <p>*****</p> <p>Also Present: Mr. Travis Jewell - Videographer</p> <p>Mr. Donald Eklund</p> <p>Mr. David Anderson</p>	<p>1 THE VIDEOGRAPHER: We are now on record. The</p> <p>2 participants should be aware that the proceeding is</p> <p>3 being recorded, and as such, all conversations held</p> <p>4 will be recorded unless there's a request and</p> <p>5 agreement to go off the record. Private</p> <p>6 conversations and/or attorney-client interactions</p> <p>7 should be held outside the presence of the remote</p> <p>8 interface. A link to the recording will be</p> <p>9 available to all parties to the case for up to</p> <p>10 90 days from today's date provided the requesting</p> <p>11 party has purchased a certified copy of the</p> <p>12 transcript.</p> <p>13 This is the remote video recorded</p> <p>14 deposition of Kirill Levchenko being taken on</p> <p>15 Tuesday, May 19, 2020. The time is now 14:05 in</p> <p>16 the UTC time zone. We are here in the matter of</p> <p>17 Counts, et al. v. General Motors, et al.</p> <p>18 My name is Travis Jewell, remote video</p> <p>19 technician on behalf of U.S. Legal Support located</p> <p>20 at 200 West Jackson, Chicago, Illinois. I am not</p> <p>21 related to any party in this action, nor am I</p> <p>22 financially interested in the outcome. At this</p> <p>23 time will the reporter, Gina Luordo on behalf of</p> <p>24 U.S. Legal Support please enter the statement per</p> <p>25 remote proceedings into the record.</p>

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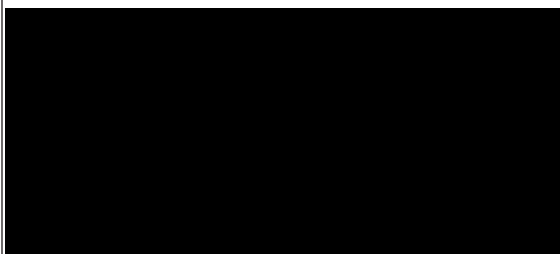
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<p style="text-align: right;">Page 6</p> <p>1 THE COURT REPORTER: The attorneys 2 participating in this deposition acknowledge that I 3 am not physically present in the deposition room 4 and that I will be reporting this deposition 5 remotely, pursuant to Federal Rule of Civil 6 Procedure 29. They further acknowledge that, in 7 lieu of an oath administered in person, the witness 8 will verbally declare his testimony in this matter 9 is under penalty of perjury. The parties and their 10 counsel consent to this arrangement and waive any 11 objections to this manner of reporting. 12 Please indicate your agreement by stating 13 your name and your agreement on the record. 14 MR. WORK-DEMBOWSKI: This is Larry 15 Work-Dembowski on behalf of Bosch LLC. I confirm 16 that we agree with that arrangement. 17 MR. SHAEFFER: This is Peter Shaeffer on behalf 18 of the firm, Hagens Berman Socol Shapiro here 19 representing the plaintiffs, and I confirm that we 20 agree to that arrangement. 21 MS. SMITH: This is Renee Smith on behalf of 22 General Motors LLC, and I also agree to that 23 arrangement. 24 (Whereupon, the witness was 25 sworn.)</p>	<p style="text-align: right;">Page 8</p> <p>1 me or hearing me during the course of the day, 2 please speak up as soon as the difficulty arises so 3 we can address it. 4 A. Okay. And I believe Peter Shaeffer has my 5 cell phone number in case the problem is on my end 6 and you need to call me. 7 Q. Very good. Thank you. 8 Are you able to hear me well now? 9 A. Yes. 10 Q. Are you able to see me clearly? 11 A. Yes. 12 Q. In front of you, can you see the window – 13 you said you can see the video where I'm speaking. 14 Can you also see the Box.com interface where 15 ex bits will be shown? 16 A. I haven't accessed it yet. Would you like 17 me to do that now? 18 Q. Yes. Please have that open in front of 19 you. Please let me know when you have it open. 20 A. I have an e-mail from Rachel Reynolds 21 inviting me to collaborate on Boxes. Is that the 22 link? 23 Q. That should be it. 24 A. I don't – it's asking me to create an 25 account.</p>
<p style="text-align: right;">Page 7</p> <p>1 KIRILL LEVCHENKO, Ph.D., 2 having been first duly sworn, was examined and 3 testified as follows: 4 EXAMINATION 5 BY MR. WORK-DEMBOWSKI: 6 Q. Good morning, Dr. Levchenko. My name is 7 Larry Work-Dembowski. I am one of the attorneys 8 representing Robert Bosch LLC in this case. I'm 9 going to be asking you a number of questions today, 10 and later in the day one of the lawyers for General 11 Motors may also have some questions for you. 12 Before we get into the heart of the 13 matter, I'm just going to go over some preliminary 14 information. As you know, we are using a remote 15 video system for today's deposition, and with all 16 things technological, there is a chance that there 17 may be a technical glitch or problem at some point 18 during the day. If it happens that either you or I 19 or someone else in the participant group here loses 20 their audio or video connection, we ask that you 21 just be patient, and we will go off the record and 22 try to get that resolved as quickly as possible. 23 Do you understand that? 24 A. Yeah. 25 Q. If you have any difficulty at all seeing</p>	<p style="text-align: right;">Page 9</p> <p>1 Q. Did you not do this beforehand? 2 A. No. I – I assumed you wouldn't want me 3 to open that stuff until the deposition. 4 MS. SMITH: Should we go off the record? 5 MR. WORK-DEMBOWSKI: We'll go off the record to 6 deal with this. This, I think, falls under the 7 category of a technical issue. 8 THE WITNESS: Well, also, in order for me to 9 access it, I have to accept the terms of service. 10 MS. SMITH: Does everyone agree we can go off 11 the record? 12 MR. SHAEFFER: Yeah, we can go off the record. 13 THE VIDEOGRAPHER: We are going off the video 14 record. The time is now 14:12 UTC. 15 (Whereupon, a short break was 16 taken.) 17 THE VIDEOGRAPHER: We are back on the video 18 record. The time is 14:20 UTC. Go ahead. 19 MR. SHAEFFER: So Dr. Levchenko has signed up 20 for his Box account. He is under the understanding 21 that these terms and conditions will apply for the 22 purposes of today's deposition only and not moving 23 forward after today's deposition, and any sort of 24 provision like the indemnification clause will be 25 the responsibility of plaintiffs' counsel. So he</p>

<p style="text-align: right;">Page 10</p> <p>1 signed up, and he's ready to proceed.</p> <p>2 MR. WORK-DEMBOWSKI: All right.</p> <p>3 BY MR. WORK-DEMBOWSKI:</p> <p>4 Q. Dr. Levchenko, you now have on a display</p> <p>5 in front of you the interface for the Box.com where</p> <p>6 exh bits will be displayed when we come to them?</p> <p>7 A. That's right.</p> <p>8 Q. And you said that you had received some</p> <p>9 training on the interface that we're using. When</p> <p>10 did you receive that training?</p> <p>11 A. Yesterday.</p> <p>12 Q. How much time did you spend receiving</p> <p>13 training on the interface?</p> <p>14 A. About 45 minutes.</p> <p>15 Q. Do you have any questions about how to use</p> <p>16 the video interface at this time?</p> <p>17 A. No.</p> <p>18 Q. Will you please describe the computer</p> <p>19 equipment that's in front of you for today's</p> <p>20 deposition?</p> <p>21 A. I have a laptop in front of me, which is</p> <p>22 what I'm using to access Zoom as well as Box, and I</p> <p>23 have another computer in front of me that I'm</p> <p>24 currently not using for anything, but if you needed</p> <p>25 me to look at a document, I could use.</p>	<p style="text-align: right;">Page 12</p> <p>1 Q. Perfect. I was going to say in the box,</p> <p>2 you'll find numbered envelopes.</p> <p>3 As we proceed today at various points,</p> <p>4 I'll ask you to open envelopes identified by their</p> <p>5 number. Will ask you agree, please, just to be</p> <p>6 patient and only open envelopes as I ask you to?</p> <p>7 A. Sure. I agree.</p> <p>8 Q. And it may be that we won't use all of</p> <p>9 those envelopes, and I'd ask that you agree that if</p> <p>10 there are any envelopes we don't open, you can</p> <p>11 leave them sealed.</p> <p>12 A. Okay. Would you like me to mail them back</p> <p>13 to you?</p> <p>14 Q. And at the end of the day, would you</p> <p>15 please mail everything back?</p> <p>16 A. Sure. I will do that.</p> <p>17 Q. We can coordinate with plaintiffs' lawyers</p> <p>18 to make all of the shipping happen.</p> <p>19 A. Okay.</p> <p>20 Q. Dr. Levchenko, have you ever been deposed</p> <p>21 before?</p> <p>22 A. No. I'm setting the envelopes aside on</p> <p>23 the corner of the table.</p> <p>24 Q. Thank you.</p> <p>25 A. I have not been deposed before.</p>
<p style="text-align: right;">Page 11</p> <p>1 Q. Is it a separate computer or just a</p> <p>2 separate monitor?</p> <p>3 A. A separate computer.</p> <p>4 Q. Is there anyone else in the room with you?</p> <p>5 A. No.</p> <p>6 Q. Is there any software running on either of</p> <p>7 your computers other than what is needed for the</p> <p>8 video interface and the Box.com interface?</p> <p>9 A. I have a browser open to access Box, and I</p> <p>10 have Zoom open. Those are the only applications.</p> <p>11 Q. Will you agree that during your deposition</p> <p>12 today, you will not use any other software such as</p> <p>13 e-mail or instant messaging to receive messages?</p> <p>14 A. I agree to that. If you ask me to open a</p> <p>15 PDF, I will, obviously, use a PDF reader.</p> <p>16 Q. Do you have any other monitors or screens</p> <p>17 in the room with you?</p> <p>18 A. I have my cell phone next to me.</p> <p>19 Q. We sent you a physical box. Do you have</p> <p>20 that box with you?</p> <p>21 A. I have it right here.</p> <p>22 Q. Have you opened that box?</p> <p>23 A. No.</p> <p>24 Q. Would you please open it at this time?</p> <p>25 A. There's numbered envelopes.</p>	<p style="text-align: right;">Page 13</p> <p>1 Q. As you may have been told, the court</p> <p>2 reporter is making a stenographic record of</p> <p>3 everything that you and I say, and it is important</p> <p>4 for her record that we not speak over each other.</p> <p>5 So will you agree to let me finish my questions</p> <p>6 before you start speaking?</p> <p>7 A. Yes.</p> <p>8 Q. And I will agree to let you finish your</p> <p>9 answers before I start speaking.</p> <p>10 For purposes of the stenographic record,</p> <p>11 it's also important that your answers be verbal.</p> <p>12 So please answer with words, yes or no instead of a</p> <p>13 nod or a shake of your head. Will you agree to do</p> <p>14 that?</p> <p>15 A. Yes.</p> <p>16 Q. You understand that you are giving</p> <p>17 testimony under oath today, correct?</p> <p>18 A. I do.</p> <p>19 Q. And you understand that your oath obliges</p> <p>20 you to testify truthfully?</p> <p>21 A. I do.</p> <p>22 Q. You understand that your testimony here</p> <p>23 today has the same effect as if you were testifying</p> <p>24 in a court of law?</p> <p>25 A. I do.</p>

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<p style="text-align: right;">Page 14</p> <p>1 Q. If I ask a question and you don't</p> <p>2 understand it, please let me know that you don't</p> <p>3 understand, and I will try to rephrase it, okay?</p> <p>4 A. Okay.</p> <p>5 Q. If I ask a question and you do not ask me</p> <p>6 for clarification, it will be assumed that you</p> <p>7 understood my question. Do you understand that?</p> <p>8 A. I do.</p> <p>9 Q. Are there any circumstances that would</p> <p>10 affect your ability to testify truthfully and</p> <p>11 completely today?</p> <p>12 A. No.</p> <p>13 Q. Depositions are not an endurance exercise.</p> <p>14 If you need a break at any point during the day,</p> <p>15 please say so. We can take a break when you need</p> <p>16 with the one caveat that we should not take a break</p> <p>17 while a question is pending. Do you understand</p> <p>18 that?</p> <p>19 A. I do.</p> <p>20 Q. Dr. Levchenko, what opinions are you</p> <p>21 offering in this case?</p> <p>22 A. I'm offering the opinions outlined in the</p> <p>23 report</p> 	<p style="text-align: right;">Page 16</p> <p>1 Q. As we go through the day today, I'll refer</p> <p>2 to this document as your first report. If I use</p> <p>3 that term and you don't understand which document</p> <p>4 I'm talking about, let me know, and we'll make sure</p> <p>5 that we're looking at the right document. Does</p> <p>6 that make sense?</p> <p>7 A. Understood.</p> <p>8 Q. You signed the original version of your</p> <p>9 report on October 28, 2019, correct?</p> <p>10 A. Yes.</p> <p>11 Q. You made a correct – excuse me?</p> <p>12 A. Nothing.</p> <p>13 Q. You made a correction to your first report</p> <p>14 on May 12, 2020 to fix a typo; is that right?</p> <p>15 A. That's correct.</p> <p>16 Q. Would you please turn to Page 18 in your</p> <p>17 first report?</p> <p>18 A. Okay.</p> <p>19 Q. Is that your signature on Page 18 of your</p> <p>20 report?</p> <p>21 A. It is.</p> <p>22 Q. And you applied that signature on May 12,</p> <p>23 2020?</p> <p>24 A. Through my counsel. This is a digital</p> <p>25 image of my signature.</p>
<p style="text-align: right;">Page 15</p>  <p>8 Q. Do you have any other opinions that you</p> <p>9 are intending to offer in this case?</p> <p>10 A. Only the opinions in my report.</p> <p>11 Q. Do you believe that you are an expert with</p> <p>12 respect to each of those opinions?</p> <p>13 A. Yes.</p> <p>14 Q. Would you please open the envelope in</p> <p>15 front of you that's labeled No. 1, and I'm going to</p> <p>16 ask my colleague to post in the shared folder on</p> <p>17 Box tab 1, which will now become Exhibit</p> <p>18 Levchenko 1.</p> <p>19 A. I have in front of me what looks to be my</p> <p>20 expert report.</p> <p>21 Q. As you said, this document, which is now</p> <p>22 Exhibit Levchenko 1, is your expert report in this</p> <p>23 case dated October 28, 2019 as corrected on May 12,</p> <p>24 2020; is that correct?</p> <p>25 A. That's what it says on the front, yes.</p>	<p style="text-align: right;">Page 17</p> <p>1 Q. In October of 2019 before you applied your</p> <p>2 signature to your report, did you review the</p> <p>3 original version of the report to verify its</p> <p>4 accuracy?</p> <p>5 A. Can you repeat that?</p> <p>6 Q. Sure. In October of 2019 before you</p> <p>7 applied your signature to your report, the original</p> <p>8 version of your report, did you review it for</p> <p>9 accuracy?</p> <p>10 A. I did.</p> <p>11 Q. And did you review the corrected version</p> <p>12 of your first report to verify its accuracy before</p> <p>13 you applied your signature again in May of 2020?</p> <p>14 A. I reviewed the corrected portion, and I</p> <p>15 assumed the rest is the same.</p> <p>16 Q. Are there any changes that you believe</p> <p>17 should be made to your first report today?</p> <p>18 A. No, other than what's in the supplemental</p> <p>19 report, which – and changes modified the</p> <p>20 conclusion to include the model year '15 vehicles.</p> <p>21 Q. Any other changes to your first report?</p> <p>22 A. No.</p> <p>23 Q. In preparing for today's deposition, did</p> <p>24 you read your first report?</p> <p>25 A. Yes.</p>

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<p style="text-align: right;">Page 18</p> <p>1 Q. Appended to your first report, sir,</p> <p>2 attached to the back of it are three appendices. I</p> <p>3 believe in the hard copy in front of you, they have</p> <p>4 tabs that are labeled A, B and C.</p> <p>5 A. That's right.</p> <p>6 Q. Nothing in any of the appendices to your</p> <p>7 first report changed when you made the corrected</p> <p>8 version of your first report last week on May 12th;</p> <p>9 is that correct?</p> <p>10 A. That's correct.</p> <p>11 Q. We can set that aside just for the moment</p> <p>12 and please open envelope No. 2, and I'll ask my</p> <p>13 colleague to post tab 2 to the shared folder on</p> <p>14 Box.com. Yes, sir, envelope 2.</p> <p>15 A. I have it opened.</p> <p>16 Q. This is your supplemental expert report in</p> <p>17 this case dated February 5, 2020, correct?</p> <p>18 A. That's right.</p> <p>19 Q. As we go through the day today, I will</p> <p>20 refer to this document as your supplemental report.</p> <p>21 If you don't understand what document I'm referring</p> <p>22 to when I say that, please let me know, and we'll</p> <p>23 clarify to make sure you're looking at the correct</p> <p>24 document.</p> <p>25 Will you please turn to Page 3 of your</p>	<p style="text-align: right;">Page 20</p> <p>1 version of your first report, correct?</p> <p>2 A. Yes.</p> <p>3 Q. Just so the record is clear, the original</p> <p>4 version of your first report is what is exhibited</p> <p>5 through the supplemental report, and that original</p> <p>6 version still has the typo that you fixed in your</p> <p>7 May 2020 corrected first report?</p> <p>8 A. Yes, that's correct.</p> <p>9 Q. Your supplemental report from February did</p> <p>10 not replace your first report, correct?</p> <p>11 A. No.</p> <p>12 MR. SHAEFFER: Objection. Vague and ambiguous.</p> <p>13 BY MR. WORK-DEMBOWSKI:</p> <p>14 Q. Your supplemental report only added more</p> <p>15 analysis to the first report, correct?</p> <p>16 A. That's correct.</p> <p>17 Q. And your first report remains the</p> <p>18 statement of your opinions in this case?</p> <p>19 A. Yes.</p> <p>20 Q. Have you conducted any additional analysis</p> <p>21 on the matters addressed by your first report or</p> <p>22 your supplemental report since you signed them?</p> <p>23 A. No.</p> <p>24 Q. Are these reports, that is, your first</p> <p>25 report and your supplemental report, a complete</p>
<p style="text-align: right;">Page 19</p> <p>1 supplemental report?</p> <p>2 A. Okay.</p> <p>3 Q. Is the signature on Page 3 your signature?</p> <p>4 A. It is.</p> <p>5 Q. Did you apply your signature to your</p> <p>6 supplemental report on February 5, 2020?</p> <p>7 A. Yes.</p> <p>8 Q. Did you review your supplemental report to</p> <p>9 verify its accuracy before signing it?</p> <p>10 A. I did.</p> <p>11 Q. Are there any changes that you believe</p> <p>12 should be made to your supplemental report?</p> <p>13 A. No.</p> <p>14 Q. Did you read your supplemental report in</p> <p>15 preparing for today's deposition?</p> <p>16 A. I did.</p> <p>17 Q. On the back of your supplemental report,</p> <p>18 there is an exh bit. It's labeled Exh bit 1. It</p> <p>19 comes after Appendix B. Do you see that?</p> <p>20 A. Yeah.</p> <p>21 Q. I believe in the hard copy in front of</p> <p>22 you, it may have a tab C?</p> <p>23 A. Yeah. I have it.</p> <p>24 Q. And that exh bit to your supplemental</p> <p>25 report is a copy of your first report, the original</p>	<p style="text-align: right;">Page 21</p> <p>1 statement of your opinions in this case and the</p> <p>2 bases for those opinions?</p> <p>3 A. Yes.</p> <p>4 Q. Are there any bases for your proffered</p> <p>5 opinions that are not contained in these reports?</p> <p>6 A. I don't believe so.</p> <p>7 Q. Do you intend to offer any opinions in</p> <p>8 this case that are not in these reports?</p> <p>9 A. I do not.</p> <p>10 Q. Did anyone assist you in the preparation</p> <p>11 of your reports in this case?</p> <p>12 A. Yes.</p> <p>13 MR. SHAEFFER: Just I will caution the witness</p> <p>14 not to reveal any communications with counsel</p> <p>15 during the preparation of the report.</p> <p>16 THE WITNESS: Understood.</p> <p>17 BY MR. WORK-DEMBOWSKI:</p> <p>18 Q. So I'm not asking for you to reveal any</p> <p>19 confidential or privileged communications. My</p> <p>20 question is just the fact of whether anyone</p> <p>21 assisted you in the preparation of your report; yes</p> <p>22 or no?</p> <p>23 A. Yes.</p> <p>24 Q. Who?</p> <p>25 A. The plaintiffs' counsel.</p>

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<p style="text-align: right;">Page 22</p> <p>1 Q. Who are the individuals in particular?</p> <p>2 A. I may not have all of them, but Peter</p> <p>3 Shaeffer and Jessica. I'm not sure what her last</p> <p>4 name was.</p> <p>5 Q. Anyone else?</p> <p>6 A. There may have been others. I don't</p> <p>7 recall right now.</p> <p>8 Q. Without revealing privileged</p> <p>9 communications, please describe what they did to</p> <p>10 assist you in preparing your report.</p> <p>11 A. They provided me a Word document template</p> <p>12 that I should use, and they reviewed my report for</p> <p>13 grammar and content.</p> <p>14 Q. What do you mean when you say they</p> <p>15 reviewed it for content?</p> <p>16 A. They gave me feedback on my conclusions</p> <p>17 and the wording and the things I was saying in the</p> <p>18 report.</p> <p>19 Q. Did they help you form your opinions in</p> <p>20 this case?</p> <p>21 MR. SHAEFFER: Objection. Vague and ambiguous.</p> <p>22 And again, I'll just caution to answer this</p> <p>23 question without getting into the details of our</p> <p>24 communications. I'm struggling to think how he can</p> <p>25 answer this question without doing that, but --</p>	<p style="text-align: right;">Page 24</p> <p>1 Q. So portions of the introduction were</p> <p>2 written by someone else?</p> <p>3 MR. SHAEFFER: Objection. Misstates prior</p> <p>4 testimony.</p> <p>5 THE WITNESS: I will say again I was provided a</p> <p>6 template. I don't recall exactly which elements</p> <p>7 were in it, but it laid out the overall structure</p> <p>8 of the document. All of the substantive components</p> <p>9 of the report are my own work.</p> <p>10 BY MR. WORK-DEMBOWSKI:</p> <p>11 Q. Can you look at paragraph 3 of your first</p> <p>12 report on Page 2. Did you write paragraph 3?</p> <p>13 A. I believe paragraph 3 was something that,</p> <p>14 you know, was part of a template.</p> <p>15 Q. Can you identify any other portions of</p> <p>16 your first report that were part of the template</p> <p>17 provided to you?</p> <p>18 A. I believe paragraph 6, I may have -- some</p> <p>19 of the wording may have been provided, maybe</p> <p>20 paragraph 10. Paragraph 33, I may have been</p> <p>21 provided a template or -- by counsel, the wording</p> <p>22 of paragraph 34, although, I filled in the</p> <p>23 individual bullet points.</p> <p>24 Q. Was -- for your supplemental report, were</p> <p>25 you also provided a template by counsel?</p>
<p style="text-align: right;">Page 23</p> <p>1 MR. WORK-DEMBOWSKI: It's a yes or no question.</p> <p>2 THE WITNESS: I would say the opinions in the</p> <p>3 reports are my own.</p> <p>4 BY MR. WORK-DEMBOWSKI:</p> <p>5 Q. What was your role in preparing the</p> <p>6 reports?</p> <p>7 A. I wrote the reports.</p> <p>8 Q. Did you draft the entire reports yourself?</p> <p>9 A. Well, as I mentioned, I was provided a</p> <p>10 template. So there were parts of the report, I</p> <p>11 believe some of the initial boilerplate text, that</p> <p>12 was provided for me.</p> <p>13 Q. Can you open your first report, please?</p> <p>14 A. The corrected or the uncorrected one?</p> <p>15 Q. The corrected, so Exh bit Levchenko 1. On</p> <p>16 Page Roman Numeral little I, there's a table of</p> <p>17 contents.</p> <p>18 A. Uh-huh.</p> <p>19 Q. Can you identify any sections that are</p> <p>20 listed on the table of contents that were written</p> <p>21 by someone other than you?</p> <p>22 A. I think parts of the intro were provided</p> <p>23 as part of the template and maybe background,</p> <p>24 again, just the heading, but the substantive</p> <p>25 elements of the report are all my own work.</p>	<p style="text-align: right;">Page 25</p> <p>1 A. I don't recall exactly, but I can look at</p> <p>2 the paragraphs and tell you if it's something I</p> <p>3 wrote or not.</p> <p>4 Q. Do you recall writing your supplemental</p> <p>5 report?</p> <p>6 A. Yes.</p> <p>7 Q. Did the template that you received from</p> <p>8 counsel also include the appendices to either of</p> <p>9 your reports?</p> <p>10 A. I wrote the appendices for the original</p> <p>11 report and the supplemental report. I believe when</p> <p>12 it was put together and provided to you, they did</p> <p>13 the assembling, but the contents of the appendices</p> <p>14 are all my own work.</p> <p>15 Q. When were you first contacted by</p> <p>16 plaintiffs' lawyers about working on this case?</p> <p>17 A. I don't remember the exact date.</p> <p>18 Q. Do you remember whether it was before</p> <p>19 July 7, 2016?</p> <p>20 A. I'm not absolutely sure, but I think it</p> <p>21 was probably after that date.</p> <p>22 Q. Was it in 2017?</p> <p>23 A. Again, I don't remember the exact date.</p> <p>24 Q. Do you remember the year?</p> <p>25 A. I don't, but if you'd like, I can look up</p>

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<p style="text-align: right;">Page 26</p> <p>1 my – check my e-mail and see when the first 2 contact was. 3 Q. Do you remember whether it was before or 4 after April of 2018? 5 A. I'm sorry. I don't. 6 Q. How about August of 2018? 7 MR. SHAEFFER: Objection. Asked and answered. 8 MR. WORK-DEMBOWSKI: I didn't ask him about 9 August. 10 THE WITNESS: August? I believe it was before 11 August. 12 BY MR. WORK-DEMBOWSKI: 13 Q. You believe it was before August of 2018? 14 A. Yeah. August is when I moved to Illinois, 15 and I believe at that time, I had already been 16 retained, but again, to answer these questions with 17 absolute certainty, I would have to check my 18 e-mail. 19 Q. Who first contacted you about working on 20 this case? 21 A. I don't remember the specific person. 22 Q. Was it somebody that you had worked with 23 before? 24 A. Again, I don't remember the specific 25 person. I believe it may have been Jessica</p>	<p style="text-align: right;">Page 28</p> <p>1 Q. Okay. How about Sommers Schwartz? 2 A. No. 3 Q. Seeger Weiss? 4 A. No. 5 Q. Carella Byrne Cecchi? 6 A. No. 7 Q. Hilliard Munoz Gonzalez? 8 A. No. 9 Q. Are you currently engaged to work on any 10 diesel emissions case other than this case? 11 A. Yes. 12 Q. Which case? 13 A. I don't – I believe I'm still retained 14 for some case – some Volkswagen cases that are not 15 part of the class action. 16 Q. Any others? 17 A. I – I don't think so. I've worked on 18 some in the past, but I believe that they're 19 complete. 20 Q. Did you testify as an expert in any of 21 those other cases? 22 A. No. 23 Q. Did you provide written opinions in any of 24 those other cases? 25 A. I've provided some written documents. I</p>
<p style="text-align: right;">Page 27</p> <p>1 Thompson if that name is – if that's the correct 2 name, but if you'd like an answer with absolute 3 certainty, I can check my e-mail and tell you. 4 Q. Is Jessica Thompson someone that you had 5 worked with before working with her on this case? 6 A. No. 7 Q. How long was it after your first contact 8 until you informed plaintiffs' counsel of the 9 opinions that you were prepared to render in this 10 case? 11 A. I don't know. I don't remember exactly 12 when they first contacted me. 13 Q. Do you remember approximately how much 14 time passed between when they first called you and 15 when you told them what you were prepared to 16 offer – 17 A. It was several months. 18 Q. Other than this case, are you currently 19 engaged to work on any matters by the Hagens Berman 20 law firm either as a testifying expert or as a 21 consultant? 22 A. No. 23 Q. What about any of the other law firms that 24 are representing plaintiffs in this matter? 25 A. I don't know all the law firms.</p>	<p style="text-align: right;">Page 29</p> <p>1 don't know if, by opinion, you have some technical 2 sense in mind or not. 3 Q. Do you know whether the written documents 4 you provided in those other cases were produced to 5 the opposing parties? 6 A. I don't know. I'm sorry. 7 Q. Do you know whether they were submitted to 8 the court? 9 A. I don't. 10 Q. Do you have any business or professional 11 relationships with any of the lawyers for 12 plaintiffs in this case other than your retention 13 in this case? 14 A. No. 15 Q. You billed plaintiffs \$500 per hour for 16 your work in this litigation, correct? 17 A. That's right. 18 Q. Is there anyone who has worked for you or 19 with you who is also being paid for his or her time 20 in connection with this case? 21 A. No. 22 Q. There are no research assistants? 23 A. No. 24 Q. No graduate students? 25 A. No.</p>

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<p style="text-align: right;">Page 30</p> <p>1 Q. No support staff?</p> <p>2 A. No.</p> <p>3 Q. No consultants?</p> <p>4 A. No.</p> <p>5 Q. How much have you been paid to date for</p> <p>6 the work you've done in connection with this case?</p> <p>7 A. I don't know. I can check.</p> <p>8 Q. Do you have an approximate?</p> <p>9 A. Let me – if you don't mind, I'll ask</p> <p>10 Peter. Is that privileged, or should I answer?</p> <p>11 MR. SHAEFFER: The amount you've been paid is</p> <p>12 not privileged, but only answer if you know.</p> <p>13 THE WITNESS: It's, I believe, upwards of</p> <p>14 20,000.</p> <p>15 BY MR. WORK-DEMBOWSKI:</p> <p>16 Q. What is the total amount of time, whether</p> <p>17 you've billed it or not, that you've spent on this</p> <p>18 matter to date?</p> <p>19 A. I don't know.</p> <p>20 Q. Do you expect to receive any additional</p> <p>21 compensation in connection with this case beyond</p> <p>22 what you've been paid already?</p> <p>23 A. I expect to be compensated for any other</p> <p>24 services on an hourly basis.</p> <p>25 Q. How much of your annual income last year</p>	<p style="text-align: right;">Page 32</p> <p>1 whether – whether what I produced was – I believe</p> <p>2 it was an expert report.</p> <p>3 Q. In general terms, can you describe what</p> <p>4 that IP case was about?</p> <p>5 A. It was about a software security</p> <p>6 mechanism.</p> <p>7 Q. Did it relate to automobiles?</p> <p>8 A. No.</p> <p>9 Q. Did it relate to emissions?</p> <p>10 A. No.</p> <p>11 Q. Did you work on behalf of the plaintiff or</p> <p>12 the defendant in that IP case?</p> <p>13 A. To be honest, I'm not sure. It was – I</p> <p>14 don't know which – who was plaintiff or defendant.</p> <p>15 It was research on prior art for a patent, so I</p> <p>16 don't know whether that would make them the</p> <p>17 plaintiff as a challenger or the defendant.</p> <p>18 Q. Did any of the work that you did on the IP</p> <p>19 case have relevance to the opinion that you're</p> <p>20 offering in this case?</p> <p>21 A. No.</p> <p>22 Q. Have you ever been engaged as a consultant</p> <p>23 by an automobile manufacturer?</p> <p>24 A. No.</p> <p>25 Q. Have you ever worked for an automobile</p>
<p style="text-align: right;">Page 31</p> <p>1 derived from work that you did in matters related</p> <p>2 to litigation?</p> <p>3 A. I couldn't tell you the exact number, but</p> <p>4 it was less than half certainly.</p> <p>5 Q. So what about for the year before?</p> <p>6 A. Less than half again.</p> <p>7 Q. And the year before that?</p> <p>8 A. I – yeah, in all years, it was less than</p> <p>9 half.</p> <p>10 Q. Was it less than a quarter?</p> <p>11 A. I'm sorry. I would have to check the</p> <p>12 exact numbers.</p> <p>13 Q. How many lawsuits have you testified in</p> <p>14 before this case?</p> <p>15 A. This is my first time testifying. I</p> <p>16 should say I have testified in court once before.</p> <p>17 Q. Can you please explain the case in which</p> <p>18 you testified in court once before?</p> <p>19 A. It was my divorce and child custody</p> <p>20 hearing.</p> <p>21 Q. So other than testifying, how many times</p> <p>22 have you offered a report as an expert witness as</p> <p>23 you have in this case? Have you ever done that</p> <p>24 before?</p> <p>25 A. I worked on an IP case. I don't know</p>	<p style="text-align: right;">Page 33</p> <p>1 manufacturer?</p> <p>2 A. No.</p> <p>3 Q. Have you ever worked for an automotive</p> <p>4 parts supplier?</p> <p>5 A. No.</p> <p>6 Q. Have you ever refused to offer an expert</p> <p>7 opinion in any case?</p> <p>8 A. I've turned down offers to work as a</p> <p>9 consultant or expert.</p> <p>10 Q. Why?</p> <p>11 A. Either because of my own time constraints</p> <p>12 or I was not interested in the subject matter.</p> <p>13 Q. Have you ever turned down offers to work</p> <p>14 in connection with automobiles?</p> <p>15 A. Yes. I – yes.</p> <p>16 Q. What offers have you turned down in</p> <p>17 connection with automobiles?</p> <p>18 A. I've been contacted by some law firms</p> <p>19 representing plaintiffs in emissions-related</p> <p>20 matters.</p> <p>21 Q. How many times has that happened?</p> <p>22 A. I would say at least once, probably more.</p> <p>23 Q. And why did you turn down those offers?</p> <p>24 A. Time constraints.</p> <p>25 Q. Any other reasons?</p>

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<p style="text-align: right;">Page 34</p> <p>1 A. Not that I can think of right now.</p> <p>2 Q. What was the nature of the opinions that</p> <p>3 you were being asked to render by the law firms</p> <p>4 that approached you about automotive cases?</p> <p>5 A. It would have been a plaintiff's side.</p> <p>6 They didn't specify clearly what exactly they were</p> <p>7 looking for.</p> <p>8 Q. Do you remember the names of any of the</p> <p>9 law firms that approached you?</p> <p>10 A. No, but if that's important, I can look</p> <p>11 those up.</p> <p>12 Q. Has a court ever evaluated your</p> <p>13 qualifications as an expert?</p> <p>14 A. I don't know.</p> <p>15 Q. Has a court ever evaluated your</p> <p>16 methodologies?</p> <p>17 A. No, not to my knowledge.</p> <p>18 Q. Has a court ever evaluated your opinions?</p> <p>19 A. Not to my knowledge.</p> <p>20 Q. You were a plaintiff in a case involving a</p> <p>21 vehicle accident once, correct?</p> <p>22 A. I don't remember that.</p> <p>23 Q. You don't remember a case that involved</p> <p>24 someone named Eckhart?</p> <p>25 A. No.</p>	<p style="text-align: right;">Page 36</p> <p>1 about a litigation involving someone named Kirill</p> <p>2 Levchenko versus someone named John Eckhart</p> <p>3 involving an automobile. Is this case about you?</p> <p>4 A. Should I open the exh bit?</p> <p>5 Q. Yes, please.</p> <p>6 A. I only see two pages, but none of that</p> <p>7 looks right. I've never been in any case like</p> <p>8 this.</p> <p>9 Q. Were you a plaintiff, a named plaintiff in</p> <p>10 a class action against a company called DCI</p> <p>11 Resorts, Inc.?</p> <p>12 A. That sounds familiar. I don't remember</p> <p>13 if – I don't recall it being a class action,</p> <p>14 though.</p> <p>15 Q. Okay. I'm going to ask my colleague to</p> <p>16 post tab 20. This will become Exh bit Levchenko 4.</p> <p>17 And if you can just wait a moment and then refresh</p> <p>18 your Box interface, the exh bit should be available</p> <p>19 to you momentarily.</p> <p>20 A. Okay. I see it. Would you like me to</p> <p>21 open it?</p> <p>22 Q. Please open Exh bit Levchenko 4. This is</p> <p>23 complaint from a case captioned Levchenko v. DCI</p> <p>24 Resorts, Inc.</p> <p>25 A. Yeah, this I remember. Yeah. That is me</p>
<p style="text-align: right;">Page 35</p> <p>1 Q. I'm going to ask my colleague to post</p> <p>2 tab 19 onto Box. This will become Levchenko</p> <p>3 Exh bit 3.</p> <p>4 Mr. – Dr. Levchenko, I ask you to look at</p> <p>5 the Box.com screen and refresh it. Once Exh bit 3</p> <p>6 is up, you can open it on your screen.</p> <p>7 A. I don't see it yet.</p> <p>8 Q. You might need to press the refresh button</p> <p>9 on the address bar of your browser.</p> <p>10 A. I'm refreshing. It's not there yet. I</p> <p>11 see Exh bit 1 and 2, though.</p> <p>12 Q. What about now?</p> <p>13 A. I'll keep refreshing.</p> <p>14 MR. SHAEFFER: Sorry. Can we go off the record</p> <p>15 for just one second?</p> <p>16 MR. WORK-DEMBOWSKI: Sure.</p> <p>17 THE VIDEOGRAPHER: Going off the video record.</p> <p>18 The time is now 14:56 UTC.</p> <p>19 (Whereupon, a short break was</p> <p>20 taken.)</p> <p>21 THE VIDEOGRAPHER: We are back on the video</p> <p>22 record. The time is now 15:11 UTC. Go ahead.</p> <p>23 BY MR. WORK-DEMBOWSKI:</p> <p>24 Q. Dr. Levchenko, the document that has been</p> <p>25 marked as Exh bit Levchenko 3 is a published report</p>	<p style="text-align: right;">Page 37</p> <p>1 in this.</p> <p>2 Q. Okay. So you were the named plaintiff in</p> <p>3 this case about DCI Resorts, Inc.?</p> <p>4 A. That's correct.</p> <p>5 Q. This DCI resorts case was about receiving</p> <p>6 unauthorized telephone calls, correct?</p> <p>7 A. I believe so, yeah.</p> <p>8 Q. What was the resolution of the case?</p> <p>9 A. I believe that my attorneys dropped it</p> <p>10 because they didn't see a way forward.</p> <p>11 Q. Did you receive any compensation in</p> <p>12 connection with this case?</p> <p>13 A. No.</p> <p>14 Q. By this case, I mean the DCI Resorts case.</p> <p>15 A. Understood. I did not.</p> <p>16 Q. You know that your lawyers in the DCI</p> <p>17 Resorts case also represented plaintiffs in some</p> <p>18 diesel emissions cases, don't you?</p> <p>19 A. I do not. Are you talking about Kazerouni</p> <p>20 Law Group?</p> <p>21 Q. Hyde & Swigart in particular.</p> <p>22 A. I did not know that.</p> <p>23 Q. Has Hyde & Swigart approached you about</p> <p>24 offering expert opinion about any diesel emissions</p> <p>25 case?</p>

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<p style="text-align: right;">Page 38</p> <p>1 A. Not to my recollection.</p> <p>2 Q. Have you discussed this case with any of</p> <p>3 your lawyers from the DCI Resorts case?</p> <p>4 A. Sorry. Which is this case?</p> <p>5 Q. I'm sorry. The present case about the</p> <p>6 diesel –</p> <p>7 A. No. No.</p> <p>8 Q. Have you ever been a plaintiff in any</p> <p>9 lawsuit other than Levchenko v. DCI Resorts? And I</p> <p>10 don't need to get into any family law issues.</p> <p>11 A. I know there was a small claims case where</p> <p>12 I was the plaintiff.</p> <p>13 Q. What was the small claims about?</p> <p>14 A. It was a telemarketing prerecorded phone</p> <p>15 call case.</p> <p>16 Q. What court was that in?</p> <p>17 A. San Diego small claims court.</p> <p>18 Q. What was the resolution of that case?</p> <p>19 A. Actually, there were two cases. One I</p> <p>20 settled with the defendants, and then the other we</p> <p>21 appeared in the small claims court. And I don't</p> <p>22 know the technical terms, but I lost.</p> <p>23 Q. You were the plaintiff in both of those</p> <p>24 cases; is that correct?</p> <p>25 A. Yes.</p>	<p style="text-align: right;">Page 40</p> <p>1 Q. Did you meet with anyone to prepare</p> <p>2 remotely or otherwise?</p> <p>3 A. I met with plaintiffs' counsel.</p> <p>4 Q. Who did you meet with?</p> <p>5 A. Peter Shaeffer and I believe some of the</p> <p>6 others present on this call. I don't remember the</p> <p>7 exact set of people present.</p> <p>8 Q. Do you remember how many people were</p> <p>9 present?</p> <p>10 A. It was myself, Peter and, perhaps, one or</p> <p>11 two others.</p> <p>12 Q. Was there anyone present other than</p> <p>13 yourself and the lawyers, anyone who is not a</p> <p>14 lawyer?</p> <p>15 A. Present during preparation?</p> <p>16 Q. Yes.</p> <p>17 A. No, there was no one else present.</p> <p>18 MR. WORK-DEMBOWSKI: Thank you. Can we pause a</p> <p>19 moment until we can get that background noise</p> <p>20 resolved.</p> <p>21 THE VIDEOGRAPHER: Going off the video record?</p> <p>22 MR. WORK-DEMBOWSKI: We can continue.</p> <p>23 BY MR. WORK-DEMBOWSKI:</p> <p>24 Q. How long, Dr. Levchenko, did your</p> <p>25 preparation discussion with the lawyers last?</p>
<p style="text-align: right;">Page 39</p> <p>1 Q. Have you ever been a defendant in any</p> <p>2 lawsuit?</p> <p>3 A. Not to my recollection. Again, family</p> <p>4 law, I don't know whether I was – which side I was</p> <p>5 in.</p> <p>6 Q. Have you ever had your work criticized in</p> <p>7 court filings?</p> <p>8 A. Not to my knowledge.</p> <p>9 Q. Have you ever been accused of defrauding</p> <p>10 someone?</p> <p>11 A. Not to my knowledge.</p> <p>12 Q. Have you ever been accused of committing a</p> <p>13 crime?</p> <p>14 A. Not to my knowledge.</p> <p>15 Q. What did you do to prepare for today's</p> <p>16 deposition?</p> <p>17 A. I reread my statements, my report and</p> <p>18 appendices.</p> <p>19 Q. Anything else?</p> <p>20 A. That's the main thing. Are there specific</p> <p>21 things you're asking about? I'm not sure.</p> <p>22 Q. How much time did you spend preparing for</p> <p>23 today's deposition?</p> <p>24 A. In total, several hours, but I would say</p> <p>25 less than – maybe less than 20.</p>	<p style="text-align: right;">Page 41</p> <p>1 A. It was probably six, maybe a little more.</p> <p>2 Six hours, maybe a little more.</p> <p>3 Q. Was it all in one session, or was it</p> <p>4 broken up in multiple sessions?</p> <p>5 A. In multiple sessions.</p> <p>6 Q. Over how many days?</p> <p>7 A. I don't remember the exact number, but at</p> <p>8 least three, maybe four.</p> <p>9 Q. When?</p> <p>10 A. There was one session early on when I</p> <p>11 think the deposition was scheduled earlier before</p> <p>12 it got moved to this current date and several more</p> <p>13 recent within the last, let's say, two, three</p> <p>14 weeks.</p> <p>15 Q. Have you spoken with anyone other than</p> <p>16 plaintiffs' lawyers about your deposition?</p> <p>17 A. I have not.</p> <p>18 Q. Have you spoken with Mr. Smithers about</p> <p>19 your deposition?</p> <p>20 A. No.</p> <p>21 Q. Did you review any documents other than</p> <p>22 your reports in preparing for today's deposition?</p> <p>23 MR. SHAEFFER: I will just caution the witness</p> <p>24 not to discuss any documents that you reviewed with</p> <p>25 counsel during preparation sessions.</p>

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<p style="text-align: right;">Page 42</p> <p>1 THE WITNESS: Could you – may I call you Larry 2 or Mr. Dembowski? Could you restate your question? 3 BY MR. WORK-DEMBOWSKI: 4 Q. You can call me Larry. 5 Did you review any documents other than 6 your written reports in preparing for today's 7 deposition? It's a yes or no question. 8 A. Peter, is that something that I should 9 answer? 10 MR. SHAEFFER: It's a yes or no question. 11 Don't discuss the details of any documents that we 12 would have discussed during our prep sessions. 13 THE WITNESS: Yes. 14 BY MR. WORK-DEMBOWSKI: 15 Q. The documents that you reviewed in 16 preparing for today's deposition, did they include 17 any documents that are not cited in your reports? 18 A. Not to my knowledge. 19 Q. Would you please explain what your 20 assignment was in this matter? 21 THE WITNESS: Peter, is that privileged? 22 MR. SHAEFFER: No. It's potentially vague in 23 terms of assignment. Kirill, I will – if there is 24 a potential privileged answer that you will give, I 25 will make an objection. So unless you hear from</p>	<p style="text-align: right;">Page 44</p> <p>1 strategies other than the two that you address in 2 your report? 3 MR. SHAEFFER: So I will caution him again. 4 You can – you can answer the question to the 5 extent you don't reveal the specifics of those 6 communications you would have had with plaintiffs' 7 counsel. 8 THE WITNESS: I don't recall being asked to 9 look at any specific mechanisms. 10 BY MR. WORK-DEMBOWSKI: 11 Q. Were you asked to look broadly for other 12 potential cycle beating or defeat device strategy 13 in the Chevy diesel Cruze? 14 MR. SHAEFFER: Objection. Vague and ambiguous. 15 THE WITNESS: I was not instructed one way or 16 another regarding other defeat devices. 17 BY MR. WORK-DEMBOWSKI: 18 Q. Did you look for any other defeat devices 19 or cycle beating strategies in the diesel Chevy 20 Cruz? 21 MR. SHAEFFER: Objection. Asked and answered. 22 THE WITNESS: I looked at the documentation for 23 potentially other things that could be a cycle 24 beating strategy. 25</p>
<p style="text-align: right;">Page 43</p> <p>1 me, I think it's – you can go ahead and answer. 2 THE WITNESS: Okay. I was asked to investigate 3 two potential cycle beating strategies. 4 BY MR. WORK-DEMBOWSKI: 5 Q. You were pointed to the particular 6 strategies and asked to evaluate them, right? 7 A. I was asked to look into two specific 8 strategies, you know, by name. By pointed, I'm not 9 sure what you mean. 10 Q. Okay. You were not asked to evaluate the 11 entirety of the software of the diesel Chevy Cruz, 12 correct? 13 A. That's correct. 14 Q. And you were not asked to review any other 15 potential defeat devices or cycle beating devices 16 on the diesel Chevy Cruze aside from the two that 17 you mentioned? 18 MR. SHAEFFER: I will – I'm going to caution 19 Mr. Levchenko not to disclose communications about 20 other potential issues he was asked to look into in 21 terms of his work in this case. 22 THE WITNESS: I'm following the advice of 23 Mr. Shaeffer. I won't answer. 24 BY MR. WORK-DEMBOWSKI: 25 Q. So were you asked to look at other</p>	<p style="text-align: right;">Page 45</p> <p>1 BY MR. WORK-DEMBOWSKI: 2 Q. And you did not identify any, correct? 3 MR. SHAEFFER: Objection. Misstates prior 4 testimony. 5 THE WITNESS: I wouldn't say it so 6 conclusively. Nothing jumped out at me, so I 7 focused on the ones that plaintiffs asked me to 8 look at. 9 BY MR. WORK-DEMBOWSKI: 10 Q. And you're not offering any opinion in 11 this litigation about any other potential cycle 12 beating or defeat device strategies in the diesel 13 Chevy Cruz, correct? 14 A. That's correct. 15 Q. You were not asked to evaluate the EDC17 16 control unit as such, were you? 17 MR. SHAEFFER: Objection. Vague and ambiguous. 18 THE WITNESS: I was asked to evaluate the 19 EDC17, but as you say, not as a whole, but 20 specifically with an interest in defeat devices. 21 BY MR. WORK-DEMBOWSKI: 22 Q. And you understand – excuse me. I didn't 23 mean to interrupt you. 24 A. I'll stop here. 25 Q. You understand that the EDC17 is the brand</p>

<p style="text-align: right;">Page 46</p> <p>1 name for an onboard computer for diesel vehicles,</p> <p>2 right?</p> <p>3 A. That's right.</p> <p>4 Q. The EDC17 itself, the computer is not what</p> <p>5 you're alleging is a defeat device, correct?</p> <p>6 A. I am referring -- by defeat device, and</p> <p>7 again, I'm not using it in the technical sense a</p> <p>8 car use would it, but let's say cycle beating</p> <p>9 devices are embedded in the EDC17 code</p> <p>10 post-calibration parameters.</p> <p>11 Q. That's specific for the diesel Chevy</p> <p>12 Cruze, correct?</p> <p>13 A. My conclusions are about the model years</p> <p>14 '14 and '15 diesel Chevy Cruz vehicles.</p> <p>15 Q. You do not have an opinion that every</p> <p>16 EDC17 in the world is somehow improper, do you?</p> <p>17 A. That is not the opinion offered in my</p> <p>18 report.</p> <p>19 Q. The EDC17 is just a computer, right?</p> <p>20 A. It -- I don't know what you mean by just a</p> <p>21 computer. So it is a computer. It has software</p> <p>22 that was programmed into it by the manufacturer and</p> <p>23 has calibration parameters. It also has actuators</p> <p>24 that control vehicle behavior as well as sensors.</p> <p>25 So it's different from the computer in front of me,</p>	<p style="text-align: right;">Page 48</p> <p>1 being told or instructed about.</p> <p>2 Q. Before you began your analysis, you were</p> <p>3 told that the two strategies you were to look at</p> <p>4 were potential cycle beating strategies, correct?</p> <p>5 A. Peter, is that privileged?</p> <p>6 MR. SHAEFFER: I think the fact of being</p> <p>7 informed about two potential cycle beating</p> <p>8 strategies is not privileged, but I will instruct</p> <p>9 you not to get into any sort of mental impressions</p> <p>10 of counsel or any of our work product in answering</p> <p>11 this question.</p> <p>12 THE WITNESS: Okay. The specific cycle beating</p> <p>13 strategies in my report were named by counsel.</p> <p>14 BY MR. WORK-DEMBOWSKI:</p> <p>15 Q. And you were told that they were potential</p> <p>16 cycle beating strategies?</p> <p>17 A. I think that's maybe skirting close to</p> <p>18 what Peter was alluding to, but I would say</p> <p>19 generally there was a suspicion there might be.</p> <p>20 Q. And you were told that these were</p> <p>21 suspected to be potential cycle beating strategies?</p> <p>22 A. I wouldn't put it in those strong terms.</p> <p>23 I believe it was more open-ended can you take a</p> <p>24 look at these.</p> <p>25 MR. SHAEFFER: Again, I would caution again not</p>
<p style="text-align: right;">Page 47</p> <p>1 but it is a computer in the sense that it has the</p> <p>2 same basic fundamental organizing principles.</p> <p>3 Q. What you believe to be the problems in</p> <p>4 this case are in the specific software that was in</p> <p>5 the Chevy Cruze vehicles and not the EDC17 computer</p> <p>6 as such; is that right?</p> <p>7 A. The problems identified or the cycle</p> <p>8 beating strategies were part of the software that</p> <p>9 was programmed into the computer. So whether you</p> <p>10 consider the software that has been programmed into</p> <p>11 the former to be part of the computer or not would</p> <p>12 be the distinguishing thing to -- in your question.</p> <p>13 I would consider it to be part of the system.</p> <p>14 Q. And that's part of the system specific to</p> <p>15 the diesel Chevy Cruze?</p> <p>16 A. That's right.</p> <p>17 Q. A different EDC17 in a different vehicle</p> <p>18 may have different software, correct?</p> <p>19 A. That's correct.</p> <p>20 Q. Who decided which two strategies you would</p> <p>21 review for your analysis?</p> <p>22 A. I don't know.</p> <p>23 Q. Did anyone instruct you about what</p> <p>24 methodology to use in evaluating those strategies?</p> <p>25 A. I don't recall a specific methodology</p>	<p style="text-align: right;">Page 49</p> <p>1 to get into the mental impressions of counsel in</p> <p>2 answering these questions. I think they've been</p> <p>3 asked and answered that he was told to review the</p> <p>4 cycle beating strategies.</p> <p>5 BY MR. WORK-DEMBOWSKI:</p> <p>6 Q. You were asked to confirm that they were,</p> <p>7 in fact, cycle beating strategies in your opinion,</p> <p>8 correct?</p> <p>9 A. No, not correct.</p> <p>10 Q. What were you asked to do?</p> <p>11 A. I think as Peter said and as I've said, I</p> <p>12 was asked to specifically look into these potential</p> <p>13 mechanisms. I was not instructed as to whether</p> <p>14 they were or were not cycle beating strategies.</p> <p>15 Q. In your report, you wrote that you were</p> <p>16 asked to review two potential cycle beating</p> <p>17 strategies. When was the first time you heard them</p> <p>18 referred to as potential cycle beating strategies?</p> <p>19 A. I don't remember.</p> <p>20 Q. Was it before you analyzed them?</p> <p>21 A. I think the term cycle beating, I'm sure,</p> <p>22 came up before I wrote my reports and before I</p> <p>23 began my analysis.</p> <p>24 Q. Would you please explain what you mean by</p> <p>25 the term cycle beating strategies?</p>

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<p style="text-align: right;">Page 50</p> <p>1 A. I mean a mechanism that allows the vehicle</p> <p>2 to perform more favorably with respect to emissions</p> <p>3 on an emissions test cycle than it would under</p> <p>4 similar conditions in real-world driving.</p> <p>5 Q. And what's the basis for that</p> <p>6 understanding of cycle beating?</p> <p>7 A. The basis is accounts in popular media and</p> <p>8 my reading of, I guess, various articles. I don't</p> <p>9 remember exactly what. It's hard to pinpoint a</p> <p>10 specific document.</p> <p>11 Q. Can you cite any government regulation for</p> <p>12 that definition of cycle beating?</p> <p>13 A. I know that there are some government</p> <p>14 regulations that define legally a defeat device,</p> <p>15 but I couldn't cite those to you. And the meaning</p> <p>16 I'm using is not a precise legal meaning as</p> <p>17 described there. It's the meaning that I gave you</p> <p>18 earlier.</p> <p>19 Q. You mentioned that you have this</p> <p>20 understanding from reading articles. What articles</p> <p>21 contain the definition of cycle beating that you</p> <p>22 just mentioned?</p> <p>23 A. I don't have an exact article I could</p> <p>24 point you to.</p> <p>25 Q. Can you cite any authority for that</p>	<p style="text-align: right;">Page 52</p> <p>1 authority where that definition was derived from.</p> <p>2 I simply stated that that's the definition I'm</p> <p>3 using in my analysis.</p> <p>4 BY MR. WORK-DEMBOWSKI:</p> <p>5 Q. In your opinion, does – for a mechanism</p> <p>6 to be cycle beating, does it have to make the</p> <p>7 difference between whether a vehicle passes or</p> <p>8 fails an emissions certification test?</p> <p>9 MR. SHAEFFER: Object to form.</p> <p>10 THE WITNESS: Could you repeat that? I want to</p> <p>11 make sure I understand your question.</p> <p>12 BY MR. WORK-DEMBOWSKI:</p> <p>13 Q. In your opinion for a mechanism to be</p> <p>14 cycle beating, does it have to make the difference</p> <p>15 between whether a vehicle passes or fails an</p> <p>16 emissions certification test?</p> <p>17 MR. SHAEFFER: Same objection.</p> <p>18 THE WITNESS: No. I think under my definition,</p> <p>19 I would say that it would help the vehicle pass it.</p> <p>20 It may not be necessarily the decisive thing. It</p> <p>21 may contribute to the vehicle passing.</p> <p>22 BY MR. WORK-DEMBOWSKI:</p> <p>23 Q. But if a vehicle would pass the</p> <p>24 certification testing either way whether the</p> <p>25 mechanism engages or not, you would still consider</p>
<p style="text-align: right;">Page 51</p> <p>1 definition?</p> <p>2 A. So the definition that I'm using is,</p> <p>3 again, the one I gave you. So that's the operating</p> <p>4 meaning. Now, where I came up with that definition</p> <p>5 is based on accounts, I believe, of the Volkswagen</p> <p>6 diesel emissions scandal where the term cycle</p> <p>7 beating first became known to me.</p> <p>8 Q. Do you consider yourself an expert in what</p> <p>9 is and what is not cycle beating?</p> <p>10 MR. SHAEFFER: Objection. Object to form.</p> <p>11 THE WITNESS: I consider myself an expert on</p> <p>12 software systems and when a cycle beating mechanism</p> <p>13 is implemented in software. I consider myself an</p> <p>14 expert in those kinds of mechanisms.</p> <p>15 BY MR. WORK-DEMBOWSKI:</p> <p>16 Q. Do you consider yourself an expert in what</p> <p>17 is and is not cycle beating?</p> <p>18 A. Not with respect to the precise legal</p> <p>19 definition.</p> <p>20 Q. Only with respect to the definition that</p> <p>21 you gave which does not come from any authority,</p> <p>22 correct?</p> <p>23 MR. SHAEFFER: Objection. Misstates prior</p> <p>24 testimony.</p> <p>25 THE WITNESS: I did not cite a specific</p>	<p style="text-align: right;">Page 53</p> <p>1 it cycle beating?</p> <p>2 MR. SHAEFFER: Object to form.</p> <p>3 THE WITNESS: If the mechanism I described</p> <p>4 never engages or never has any effect, then I would</p> <p>5 not consider it to be – again, on any emissions</p> <p>6 test, I would not consider it to be a cycle beating</p> <p>7 mechanism.</p> <p>8 BY MR. WORK-DEMBOWSKI:</p> <p>9 Q. And if the – is a cycle beating mechanism</p> <p>10 the same as a defeat device?</p> <p>11 MR. SHAEFFER: Object to the form.</p> <p>12 THE WITNESS: Defeat device has a precise legal</p> <p>13 meaning. In my report, I use the definition I gave</p> <p>14 you earlier.</p> <p>15 BY MR. WORK-DEMBOWSKI:</p> <p>16 Q. So you are not rendering an opinion that</p> <p>17 either of the mechanisms you describe in your</p> <p>18 report is a defeat device?</p> <p>19 A. I'm not rendering a legal opinion.</p> <p>20 Q. You're not rendering an opinion that</p> <p>21 either of the mechanisms that you describe in your</p> <p>22 report is a defeat device?</p> <p>23 A. I'm not rendering a legal opinion as to</p> <p>24 whether the mechanisms I describe, which I describe</p> <p>25 as cycle beating mechanisms or mechanisms that</p>

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<p style="text-align: right;">Page 54</p> <p>1 would contribute to a vehicle performing better on 2 cycles, meets the legal definition of a defeat 3 device. I'm not operating under the legal 4 definition because I'm not a lawyer. 5 Q. I think that's a yes, but I'm going to 6 repeat the question. It's a yes or no question. 7 You are not offering an opinion that the 8 two mechanisms you describe in your reports are 9 defeat devices? 10 MR. SHAEFFER: Objection. Asked and answered. 11 THE WITNESS: I believe my conclusions imply 12 certain conclusions that you would have to draw on 13 a legal basis. So in order for me to answer it yes 14 or no, I would have to refer to the legal 15 definition, and that's not something I'm doing. 16 So again, to put it another way, the 17 opinions I'm offering have implications on the 18 questions you are asking. So I would hesitate to 19 say no because that would misstate the nature of my 20 opinions. 21 BY MR. WORK-DEMBOWSKI: 22 23 24 25</p>	<p style="text-align: right;">Page 56</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</p>
<p style="text-align: right;">Page 55</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</p>	<p style="text-align: right;">Page 57</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</p>

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<p style="text-align: right;">Page 58</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 you performed in this case if you had not been</p> <p>5 asked to do so by plaintiffs' counsel?</p> <p>6 MR. SHAEFFER: Objection. Vague and ambiguous.</p> <p>7 THE WITNESS: I would not be able to do this</p> <p>8 analysis without the documents made available to</p> <p>9 me.</p> <p>10 BY MR. WORK-DEMBOWSKI:</p> <p>11 Q. Have you ever analyzed the software for</p> <p>12 any diesel vehicle and not found cycle beating</p> <p>13 strategies?</p> <p>14 A. I don't remember all of the vehicles I</p> <p>15 looked at, but there are certainly ones that I</p> <p>16 looked at where I didn't find something.</p> <p>17 MR. SHAEFFER: And I would also –</p> <p>18 MR. WORK-DEMBOWSKI: I'm sorry, Peter?</p> <p>19 MR. SHAEFFER: I would caution Dr. Levchenko in</p> <p>20 answering these questions not to reveal specifics</p> <p>21 of any consulting work where there would be</p> <p>22 potential privilege involved or confidentiality</p> <p>23 involved.</p> <p>24 THE WITNESS: Understood.</p> <p>25</p>	<p style="text-align: right;">Page 60</p> <p>1 this case? Let me clarify that question.</p> <p>2 Have you analyzed the software for the</p> <p>3 emissions controls on any diesel vehicle models</p> <p>4 other than what you've analyzed for this case and</p> <p>5 what you've looked at for the article that you</p> <p>6 worked on related to Volkswagon and Fiat Chrysler</p> <p>7 vehicles?</p> <p>8 A. Yes.</p> <p>9 Q. How many?</p> <p>10 A. I don't know the exact number.</p> <p>11 Q. Approximately?</p> <p>12 A. More than five.</p> <p>13 Q. More than 10?</p> <p>14 A. I'm not sure.</p> <p>15 Q. Of those five or more than five, outside</p> <p>16 of the context of this litigation and the</p> <p>17 Volkswagon and Fiat Chrysler article, how many</p> <p>18 times did you find no cycle beating mechanisms in</p> <p>19 the software?</p> <p>20 A. I don't know, and the issue is some of</p> <p>21 them I only looked at a little bit. Some of them I</p> <p>22 only skimmed documentation looking for similar</p> <p>23 kinds of things. So I don't want my answer to be</p> <p>24 interpreted as definitively being yes or no.</p> <p>25 Q. Do you have a standard methodology that</p>
<p style="text-align: right;">Page 59</p> <p>1 BY MR. WORK-DEMBOWSKI:</p> <p>2 Q. Have you – can you tell me what vehicles,</p> <p>3 diesel vehicles you've analyzed where you found no</p> <p>4 cycle beating strategies?</p> <p>5 A. I couldn't tell you that.</p> <p>6 Q. How many have there been?</p> <p>7 A. How many of –</p> <p>8 Q. How many diesel vehicles have you analyzed</p> <p>9 and found no cycle beating strategies?</p> <p>10 A. I don't – I don't have that answer for</p> <p>11 you. I'm sorry. I don't remember how many</p> <p>12 different pieces of software I looked at.</p> <p>13 Q. Was it more than one?</p> <p>14 A. I've certainly looked at more than one</p> <p>15 piece of software or documentation.</p> <p>16 Q. For how many vehicle models have you</p> <p>17 looked at the software documentation for diesel</p> <p>18 vehicles?</p> <p>19 A. I would say more than 10, but I would</p> <p>20 hesitate to give an exact number.</p> <p>21 Q. How many of those were in the context of</p> <p>22 the article that you worked on about Volkswagon and</p> <p>23 Fiat Chrysler?</p> <p>24 A. I don't remember the exact number.</p> <p>25 Q. Was it anything other than what you did in</p>	<p style="text-align: right;">Page 61</p> <p>1 you use when you look at the software for these</p> <p>2 types of vehicles?</p> <p>3 A. Yes. There is a methodology I follow.</p> <p>4 It's the same as outlined in this report.</p> <p>5 Q. And you applied that same methodology to</p> <p>6 these other software documentations for other</p> <p>7 diesel vehicles, and you found no cycle beating</p> <p>8 mechanisms?</p> <p>9 MR. SHAEFFER: Objection. Misstates prior</p> <p>10 testimony.</p> <p>11 THE WITNESS: In this particular case, I had</p> <p>12 access to documentation, technical files, A2L files</p> <p>13 and so on. So the things I looked at for other</p> <p>14 vehicles are different from what I looked at here.</p> <p>15 BY MR. WORK-DEMBOWSKI:</p> <p>16 Q. And how did you apply the same</p> <p>17 methodology?</p> <p>18 A. Same methodology as –</p> <p>19 Q. I asked you if you apply the same</p> <p>20 methodology when you look at these types of</p> <p>21 software, and you said that you applied the same</p> <p>22 methodology as described in your report when you</p> <p>23 looked at other pieces of software. And I'm trying</p> <p>24 to understand how you did that when you now say you</p> <p>25 did not have the same types of documentation. I'm</p>

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<p style="text-align: right;">Page 62</p> <p>1 trying to understand the methodology that you used.</p> <p>2 Please explain.</p> <p>3 A. Got it. So the methodology described</p> <p>4 requires access to certain kinds of documentation</p> <p>5 and technical files. When those are available,</p> <p>6 when they have been in prior situations, I use the</p> <p>7 exact methodology described here. In cases where</p> <p>8 that's not available as in the case of the How They</p> <p>9 Did It article, there's some overlap in</p> <p>10 methodology, for example, how I look at the</p> <p>11 software documentation, but some of the elements</p> <p>12 that went into this report were simply not possible</p> <p>13 in the How They Did It article.</p> <p>14 Q. Why have you analyzed the software for</p> <p>15 other vehicles other than in this litigation and in</p> <p>16 the How They Did It article? For what purpose?</p> <p>17 A. Other than those? So in some cases</p> <p>18 because I was interested in answering the question</p> <p>19 whether or not there are cycle beating mechanisms</p> <p>20 in them. In other cases, it was part of a</p> <p>21 consulting contract.</p> <p>22 Q. Was it as part of your work at the</p> <p>23 university?</p> <p>24 MR. SHAEFFER: Objection to form, but you can</p> <p>25 answer.</p>	<p style="text-align: right;">Page 64</p> <p>1 you believe you are an expert for purposes of this</p> <p>2 case?</p> <p>3 A. Cyberphysical systems.</p> <p>4 Q. Do you believe that you're an expert in</p> <p>5 the field of automotive engineering?</p> <p>6 A. No.</p> <p>7 Q. You have no training or experience in the</p> <p>8 field of automotive engineering, do you?</p> <p>9 A. That's correct.</p> <p>10 Q. You are not an expert in diesel</p> <p>11 technology, are you?</p> <p>12 A. I'm not an expert in diesel technology.</p> <p>13 Q. You have no training or experience in the</p> <p>14 field of diesel technology?</p> <p>15 A. That's correct.</p> <p>16 Q. You're not an expert on emissions laws or</p> <p>17 regulations, correct?</p> <p>18 A. That's correct.</p> <p>19 Q. You have no training or experience in the</p> <p>20 field of emissions laws or regulations?</p> <p>21 A. That is correct.</p> <p>22 Q. You're also not an expert in the field of</p> <p>23 diesel emissions technology, correct?</p> <p>24 A. Correct.</p> <p>25 Q. You have no training or experience in the</p>
<p style="text-align: right;">Page 63</p> <p>1 THE WITNESS: Yeah, some of that was part of</p> <p>2 the work. It was part of the How They Did It work.</p> <p>3 BY MR. WORK-DEMBOWSKI:</p> <p>4 Q. Okay. Aside from the How They Did It</p> <p>5 work, has your analysis of software documentation</p> <p>6 outside of the context of this litigation and</p> <p>7 outside of the context of the How They Did It</p> <p>8 article, was that part of your work at the</p> <p>9 university as a professor?</p> <p>10 A. No.</p> <p>11 Q. Have you reported or published the results</p> <p>12 of your analysis of the software in any diesel</p> <p>13 vehicles aside from the How They Did It article and</p> <p>14 what you've done in this litigation?</p> <p>15 A. Not publicly. As I mentioned, some of my</p> <p>16 work was part of a consulting agreement where there</p> <p>17 was a written product. I don't know what the</p> <p>18 attorneys did with it.</p> <p>19 Q. Was any of that consulting work done for</p> <p>20 someone that was not lawyers or a law firm?</p> <p>21 A. No.</p> <p>22 Q. Would you like to take a short break?</p> <p>23 We've been going for a little while.</p> <p>24 A. You can keep going.</p> <p>25 Q. Dr. Levchenko, what is the field in which</p>	<p style="text-align: right;">Page 65</p> <p>1 field of diesel emissions technology?</p> <p>2 A. I want to be careful about the term</p> <p>3 experience because, you know, my work would</p> <p>4 certainly qualify as experience, but if you mean</p> <p>5 prior to the How They Did It article, then no.</p> <p>6 Q. You're not an expert in chemistry?</p> <p>7 A. No.</p> <p>8 Q. You're not an expert in physics?</p> <p>9 A. No.</p> <p>10 Q. You're not an expert in thermodynamics?</p> <p>11 A. No.</p> <p>12 Q. You're not an expert in consumer</p> <p>13 expectations?</p> <p>14 MR. SHAEFFER: Objection. Vague as to</p> <p>15 expectations.</p> <p>16 THE WITNESS: To the extent I understand what</p> <p>17 that means, no.</p> <p>18 BY MR. WORK-DEMBOWSKI:</p> <p>19 Q. You're not an expert in consumer</p> <p>20 decision-making?</p> <p>21 A. Correct.</p> <p>22 Q. Would you please get your first report,</p> <p>23 it's Exhibit Levchenko 1, and turn to Appendix A?</p> <p>24 A. Okay.</p> <p>25 Q. Appendix A to your first report is your</p>

<p style="text-align: right;">Page 66</p> <p>1 CV, correct?</p> <p>2 A. Yes.</p> <p>3 Q. Is it current?</p> <p>4 A. The list of students has changed, but</p> <p>5 otherwise, it's current.</p> <p>6 Q. Does your CV reflect a complete and</p> <p>7 accurate description of your educational and</p> <p>8 professional background?</p> <p>9 A. Yes.</p> <p>10 Q. Do you have any changes or corrections or</p> <p>11 updates to it aside from the list of current</p> <p>12 students?</p> <p>13 A. No.</p> <p>14 Q. You included in your CV in this case all</p> <p>15 of the background information that you thought</p> <p>16 would be relevant to understand your expertise to</p> <p>17 testify as an expert in this case, correct?</p> <p>18 MR. SHAEFFER: Object to form, but you can</p> <p>19 answer.</p> <p>20 THE WITNESS: I have a list of selected</p> <p>21 publications, I think. Some of my other work also</p> <p>22 forms part of my expertise.</p> <p>23 BY MR. WORK-DEMBOWSKI:</p> <p>24 Q. Do you have any other work related to</p> <p>25 diesel emissions that you did not include on your</p>	<p style="text-align: right;">Page 68</p> <p>1 Q. As an undergraduate, did you do any</p> <p>2 research on any of those topics I just mentioned?</p> <p>3 A. No.</p> <p>4 Q. You also hold a Ph.D. in computer science,</p> <p>5 correct?</p> <p>6 A. That's correct.</p> <p>7 Q. Did you earn a master's degree between</p> <p>8 your undergraduate and your Ph.D.?</p> <p>9 A. There's, I'd say, an implied master's that</p> <p>10 is granted if you leave before obtaining a Ph.D.</p> <p>11 So if I were to not have completed my Ph.D., I</p> <p>12 would have a master's degree, but since I've</p> <p>13 completed it, it's just a Ph.D.</p> <p>14 Q. You received your Ph.D. in 2008, correct?</p> <p>15 A. Yes.</p> <p>16 Q. During your work towards your Ph.D., did</p> <p>17 you take any courses on automotive engineering?</p> <p>18 A. I took classes on -- a course on software</p> <p>19 engineering, which would have bearing on automotive</p> <p>20 engineering to the extent that software is involved</p> <p>21 in how a vehicle operates.</p> <p>22 Q. Was any aspect of the course on software</p> <p>23 engineering that you took specifically related to</p> <p>24 automobile?</p> <p>25 A. Not specifically to automobiles.</p>
<p style="text-align: right;">Page 67</p> <p>1 CV that you believe would be relevant to your</p> <p>2 expertise in this case?</p> <p>3 A. Not to diesel emissions. The work I was</p> <p>4 referring to is work on software analysis, which is</p> <p>5 what the task was in this case.</p> <p>6 Q. You hold a B.A. degree in mathematics and</p> <p>7 computer science, correct?</p> <p>8 A. That's correct.</p> <p>9 Q. B.A. stands for bachelor of arts?</p> <p>10 A. Yes.</p> <p>11 Q. It's not a bachelor of science?</p> <p>12 A. It is not.</p> <p>13 Q. You received your B.A. in 2001?</p> <p>14 A. Correct.</p> <p>15 Q. During your undergraduate studies working</p> <p>16 towards your B.A. degree, did you take any courses</p> <p>17 on automotive engineering?</p> <p>18 A. No.</p> <p>19 Q. Did you take any courses as an</p> <p>20 undergraduate related to diesel vehicles?</p> <p>21 A. No.</p> <p>22 Q. Did you take any courses as an</p> <p>23 undergraduate related to vehicle emissions or</p> <p>24 defeat devices?</p> <p>25 A. No.</p>	<p style="text-align: right;">Page 69</p> <p>1 Q. During your Ph.D. work, did you take any</p> <p>2 courses related to diesel vehicles?</p> <p>3 A. No.</p> <p>4 Q. During your Ph.D. work, did you take any</p> <p>5 courses related to vehicle emissions or defeat</p> <p>6 devices?</p> <p>7 A. No.</p> <p>8 Q. During your Ph.D. work, did you do any</p> <p>9 research on automobiles, diesel vehicles, vehicle</p> <p>10 emissions or defeat devices?</p> <p>11 A. No.</p> <p>12 Q. During your Ph.D. work, did you teach any</p> <p>13 classes on any of those topics?</p> <p>14 A. No.</p> <p>15 Q. Do you have any degrees besides your Ph.D.</p> <p>16 and B.A. that are listed on your CV?</p> <p>17 A. Not to my knowledge.</p> <p>18 Q. I want to take a little bit about your</p> <p>19 work experience. You currently are an associate</p> <p>20 professor of electrical and computer engineering at</p> <p>21 the University of Illinois Urbana-Champaign,</p> <p>22 correct?</p> <p>23 A. That's correct.</p> <p>24 Q. And according to your CV, you've had that</p> <p>25 position since the fall of 2018; is that right?</p>

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<p style="text-align: right;">Page 70</p> <p>1 A. That's correct.</p> <p>2 Q. In your report, it says that you've been</p> <p>3 at the University of Illinois Urbana-Champaign</p> <p>4 since the fall of 2019. Which is correct? That's</p> <p>5 in paragraph 7 of your first report.</p> <p>6 A. 2018 is correct.</p> <p>7 Q. 2018?</p> <p>8 A. Yeah. I mean, both are technically</p> <p>9 correct, but the CV is --</p> <p>10 Q. When you started there is 2018; is that</p> <p>11 correct?</p> <p>12 A. Correct.</p> <p>13 Q. Would you please open envelope No. 3, and</p> <p>14 I'll ask my colleague to -- yes, No. 3. Thank you,</p> <p>15 to post tab 3 on Box.com. This is Exh bit</p> <p>16 Levchenko 5 for the record.</p> <p>17 Do you recognize the document that's been</p> <p>18 posted as Exh bit Levchenko 5?</p> <p>19 A. It looks like the page from the EC -- my</p> <p>20 home department describing who I am and my research</p> <p>21 interests.</p> <p>22 Q. It's your profile page from the University</p> <p>23 of Illinois website, correct?</p> <p>24 A. Yes.</p> <p>25 Q. Do you have any reason to believe that</p>	<p style="text-align: right;">Page 72</p> <p>1 the attacker is effectively the person developing</p> <p>2 the software. They're causing the system to behave</p> <p>3 differently from how it's stated or advertised to</p> <p>4 behave.</p> <p>5 Q. In what other context have you analyzed</p> <p>6 system security by looking at the inherent way that</p> <p>7 the software operates rather than looking at an</p> <p>8 external attack?</p> <p>9 A. I'm not sure -- I'm not sure what you</p> <p>10 mean.</p> <p>11 Q. Maybe I misunderstood the thing that you</p> <p>12 just said. You said that in the subdiscipline of</p> <p>13 computer engineering or computer science that is</p> <p>14 security, typically -- well, you didn't use the</p> <p>15 word typically, but it often analyzes how somebody</p> <p>16 might abuse or cause a system to behave</p> <p>17 differently, and usually by that, you mean an</p> <p>18 attacker or somebody who might try to hack in?</p> <p>19 A. That's right.</p> <p>20 Q. And you drew a distinction to the software</p> <p>21 in this case which you analyzed from the way that</p> <p>22 it operates by its own nature. Is that a fair</p> <p>23 description?</p> <p>24 A. Yes.</p> <p>25 Q. You're not analyzing in this case how</p>
<p style="text-align: right;">Page 71</p> <p>1 your profile page for the University of Illinois</p> <p>2 website is inaccurate?</p> <p>3 A. I have no reason to believe that.</p> <p>4 Q. This page states that your research</p> <p>5 interests are cyberphysical system security,</p> <p>6 network security, e-crime and internet service</p> <p>7 abuse, correct?</p> <p>8 A. That's correct.</p> <p>9 Q. Is that a complete and accurate list of</p> <p>10 your research interests?</p> <p>11 A. Those are my primary research interests.</p> <p>12 I have other research interests, but they wouldn't</p> <p>13 fall into this primary category.</p> <p>14 Q. The first item on that list, cyberphysical</p> <p>15 system security, can you explain what you mean or</p> <p>16 what is meant by security in this context?</p> <p>17 A. Yeah. So security is a subdiscipline of</p> <p>18 computer engineering or computer science that</p> <p>19 analyzes how systems would behave in an adversarial</p> <p>20 setting. So this is an analysis of how might</p> <p>21 somebody try to abuse or cause a system to behave</p> <p>22 differently. Now, usually by that, we mean an</p> <p>23 attacker, somebody who might try to hack into your</p> <p>24 thermostat or nuclear power plant.</p> <p>25 In the case of diesel emissions cheating,</p>	<p style="text-align: right;">Page 73</p> <p>1 someone might hack into the software --</p> <p>2 A. That's correct.</p> <p>3 Q. -- of the diesel Chevy Cruze?</p> <p>4 A. Yeah, that's correct. My analysis is not</p> <p>5 about an external attacker manipulating the</p> <p>6 vehicle.</p> <p>7 Q. So in what other contexts in your work on</p> <p>8 system security have you analyzed the inherent</p> <p>9 features of software rather than how the system</p> <p>10 might be attacked externally?</p> <p>11 A. Well, all analysis is about the system</p> <p>12 inherently under certain conditions, but I think --</p> <p>13 I think you're asking something else, so perhaps,</p> <p>14 you could restate your question.</p> <p>15 Q. What other analyses of system security</p> <p>16 have you done in what other field, what other</p> <p>17 products that did not relate to external attacks,</p> <p>18 but instead, related to the internal inherent</p> <p>19 functioning of the software?</p> <p>20 A. Yes. So automotive defeat devices or</p> <p>21 cycle beating mechanisms are the only case where</p> <p>22 the attacker is not somebody external, but</p> <p>23 effectively somebody who is building the system.</p> <p>24 That's one of the unique and interesting</p> <p>25 characteristics and something we highlight in the</p>

<p style="text-align: right;">Page 74</p> <p>1 How They Did It article.</p> <p>2 Q. That is unique to automotive software?</p> <p>3 A. It's unique to diesel emissions evasion.</p> <p>4 At least that's the case where we've identified</p> <p>5 that happening for sure. There are other areas</p> <p>6 where there are similar incentives and that those</p> <p>7 things could happen.</p> <p>8 Q. Diesel emissions are the only field in</p> <p>9 which you've conducted that sort of analysis?</p> <p>10 MR. SHAEFFER: Objection. Misstates prior</p> <p>11 testimony.</p> <p>12 THE WITNESS: No. We've looked at other kinds</p> <p>13 of systems where a similar dynamic may exist.</p> <p>14 BY MR. WORK-DEMBOWSKI:</p> <p>15 Q. What other kinds of systems?</p> <p>16 A. So we looked briefly at televisions that</p> <p>17 have an Energy Star certification where the</p> <p>18 manufacturer may have an incentive to effectively</p> <p>19 cheat on the Energy Star testing to make the TV</p> <p>20 look like it has lower emissions or lower power</p> <p>21 consumption than it would when the consumer takes</p> <p>22 it home. That was a brief cursory analysis that we</p> <p>23 did roughly in the How They Did It time frame.</p> <p>24 Q. When you say we, who are you – who are</p> <p>25 we?</p>	<p style="text-align: right;">Page 76</p> <p>1 ago, you commented that you have a list of students</p> <p>2 on your CV. Without needing to go into the names</p> <p>3 of any of those individuals, have any Ph.D.</p> <p>4 students whose work you have overseen in the past</p> <p>5 or whose work you currently oversee, have any of</p> <p>6 them done research or work related to diesel</p> <p>7 vehicles?</p> <p>8 A. Well, one of the students is a coauthor on</p> <p>9 the How They Did It article, so obviously, he</p> <p>10 worked on that. And there was a master's student</p> <p>11 who is not listed here that I advised who didn't</p> <p>12 work on diesel emissions specifically, but worked</p> <p>13 on general automobile security questions.</p> <p>14 Q. Who was the student who was a coauthor on</p> <p>15 the How You Did It article, How They Did It</p> <p>16 article?</p> <p>17 A. Guo Li.</p> <p>18 Q. Is that G-u-o, L-i?</p> <p>19 A. That's correct.</p> <p>20 Q. He's listed No. 1 in your CV?</p> <p>21 A. That's correct.</p> <p>22 Q. Any others?</p> <p>23 A. There were other students who are authors</p> <p>24 on the article who are not my students.</p> <p>25 Q. Any other of your students that have done</p>
<p style="text-align: right;">Page 75</p> <p>1 A. I'm sorry. This is academically. In this</p> <p>2 case, it was – it was just me.</p> <p>3 Q. Did you apply any of the same methodology</p> <p>4 in analyzing television software as you've used in</p> <p>5 this case?</p> <p>6 A. Conceptually, yes, but in this case, I</p> <p>7 relied more heavily on the software documentation,</p> <p>8 whereas, in the television set, I looked at looking</p> <p>9 purely at the software. So there was no</p> <p>10 documentation. Does that make sense?</p> <p>11 Q. In your job at the University of Illinois,</p> <p>12 do you teach any courses related to automotive</p> <p>13 engineering?</p> <p>14 A. No.</p> <p>15 Q. Any courses related to diesel vehicles?</p> <p>16 A. No.</p> <p>17 Q. Any courses related to vehicle emissions?</p> <p>18 A. No.</p> <p>19 Q. Any courses related to cycle beating</p> <p>20 strategies?</p> <p>21 A. No.</p> <p>22 Q. Any courses relating to defeat devices?</p> <p>23 A. No, and I don't think there are such</p> <p>24 courses anywhere. At least, I hope not.</p> <p>25 Q. When we were looking at your CV a moment</p>	<p style="text-align: right;">Page 77</p> <p>1 work on diesel vehicles?</p> <p>2 A. Not to my knowledge.</p> <p>3 Q. I'd like to come back to your professional</p> <p>4 experience at the University of California San</p> <p>5 Diego.</p> <p>6 A. Okay.</p> <p>7 Q. So I'm looking at the first page of your</p> <p>8 CV. Your first position at the University of</p> <p>9 California San Diego is listed as an assistant</p> <p>10 research scientist?</p> <p>11 A. That's correct.</p> <p>12 Q. And you held that position from 2011 until</p> <p>13 2017?</p> <p>14 A. That's correct.</p> <p>15 Q. And then your title changed to associate</p> <p>16 research scientist; is that correct?</p> <p>17 A. Yeah, that's correct. It's just a</p> <p>18 promotion. It's the same kind of job.</p> <p>19 Q. Okay. What is the difference between an</p> <p>20 assistant research scientist and an associate</p> <p>21 research scientist at the University of California</p> <p>22 San Diego?</p> <p>23 A. It's just simply part of the promotion</p> <p>24 letter, so – ladder. So after however many years,</p> <p>25 I don't remember exactly, put together a file, and</p>

<p style="text-align: right;">Page 78</p> <p>1 you get letter writers. And if the various</p> <p>2 committees decide that you are up to the standards</p> <p>3 of that university, you're promoted to associate.</p> <p>4 It's similar to the professor ladder except it's a</p> <p>5 separate kind of track of research scientist.</p> <p>6 Q. Did any of your work while you were at the</p> <p>7 University of California San Diego, aside from</p> <p>8 anything you did on the How They Did It article,</p> <p>9 relate to diesel technology?</p> <p>10 A. Only to diesel technology as far as it</p> <p>11 involves computer systems that control the behavior</p> <p>12 of the diesel vehicle, but not diesel combustion,</p> <p>13 for example.</p> <p>14 Q. Diesel emissions?</p> <p>15 A. Not diesel emissions.</p> <p>16 Q. Did any classes that you taught while you</p> <p>17 were at the University of California San Diego</p> <p>18 relate to diesel emissions?</p> <p>19 A. Not to diesel emissions.</p> <p>20 Q. Did they relate to diesel technology more</p> <p>21 generally?</p> <p>22 A. Yes, because diesel technology today is</p> <p>23 controlled by a computer. And so pretty much</p> <p>24 everything I do has to do with computers from the</p> <p>25 intro class I teach on how computers work to the</p>	<p style="text-align: right;">Page 80</p> <p>1 A. That's correct.</p> <p>2 Q. Did your work in those positions include</p> <p>3 work on diesel technology?</p> <p>4 A. Same answer as before to the extent that</p> <p>5 diesel technology today is about computer control.</p> <p>6 My work in the past has to do with computer control</p> <p>7 and computer security.</p> <p>8 MR. WORK-DEMBOWSKI: I'm going to suggest we</p> <p>9 take a break.</p> <p>10 MR. SHAEFFER: That works.</p> <p>11 THE VIDEOGRAPHER: Going off the video record.</p> <p>12 The time is now 16:15 UTC.</p> <p>13 (Whereupon, a short break was</p> <p>14 taken.)</p> <p>15 THE VIDEOGRAPHER: We are back on the video</p> <p>16 record. The time is now 16:32 UTC. Go ahead.</p> <p>17 BY MR. WORK-DEMBOWSKI:</p> <p>18 Q. Welcome back, Dr. Levchenko.</p> <p>19 In the field of automotive engineering,</p> <p>20 what is the difference between software coding and</p> <p>21 calibration?</p> <p>22 A. So the code is the program code. That's</p> <p>23 the instructions that the computer, the ECU will be</p> <p>24 executing. Calibrations are the values that it</p> <p>25 will use in the calculation itself. So – well,</p>
<p style="text-align: right;">Page 79</p> <p>1 computer security classes that we analyze software</p> <p>2 for how it might be used. So all of that has to do</p> <p>3 with diesel engines today because diesel engines</p> <p>4 today are controlled by a computer.</p> <p>5 Q. But nothing else specific to diesel</p> <p>6 engineering?</p> <p>7 A. Nothing specific to what there is outside</p> <p>8 of the computer system.</p> <p>9 Q. Did any of the classes that you taught at</p> <p>10 University of California San Diego relate to defeat</p> <p>11 devices?</p> <p>12 A. No.</p> <p>13 Q. Did any of the courses that you taught at</p> <p>14 University of California San Diego relate to cycle</p> <p>15 beating strategies?</p> <p>16 A. No.</p> <p>17 Q. You – what did you do between earning</p> <p>18 your Ph.D. in 2008 and starting at University of</p> <p>19 California San Diego in 2011?</p> <p>20 A. I was a post-doc and then a position</p> <p>21 called a project scientist, which is similar to a</p> <p>22 research scientist, but, you know, different for</p> <p>23 technical academic reasons.</p> <p>24 Q. Was that also at the University of</p> <p>25 California San Diego?</p>	<p style="text-align: right;">Page 81</p> <p>1 I'll leave it at that.</p> <p>2 Q. Is it fair to say that software code can</p> <p>3 be written in a way that allows engineers to</p> <p>4 determine the values that the code uses for</p> <p>5 calculations?</p> <p>6 A. Well, the documentation would be the thing</p> <p>7 that the engineers would refer to.</p> <p>8 Q. But the code is written in a way that the</p> <p>9 engineers can instruct the code to behave one way</p> <p>10 or another?</p> <p>11 A. Yes.</p> <p>12 Q. And calibration is the term that's used</p> <p>13 for the process of determining the values the code</p> <p>14 uses; is that correct?</p> <p>15 A. Yes. That is my understanding.</p> <p>16 Q. Is it also your understanding that</p> <p>17 calibration can be determinative of vehicle</p> <p>18 behavior?</p> <p>19 A. Yes.</p> <p>20 Q. And the same software function calibrated</p> <p>21 in different ways can produce different results in</p> <p>22 vehicle behavior, correct?</p> <p>23 A. Correct.</p> <p>24 Q. Some code could be calibrated in a way</p> <p>25 that it does nothing at all?</p>

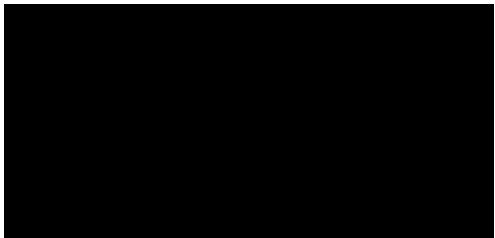
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<p style="text-align: right;">Page 82</p> <p>1 A. Correct.</p> <p>2 MR. SHAEFFER: Object to the form.</p> <p>3 BY MR. WORK-DEMBOWSKI:</p> <p>4 Q. Calibration is more than just fine tuning</p> <p>5 of a vehicle, right?</p> <p>6 MR. SHAEFFER: Object to the form.</p> <p>7 THE WITNESS: I would agree with that.</p> <p>8 BY MR. WORK-DEMBOWSKI:</p> <p>9 Q. Have you ever performed software coding</p> <p>10 work for an automobile?</p> <p>11 A. No.</p> <p>12 Q. Have you ever written software relating to</p> <p>13 emissions controls on a vehicle?</p> <p>14 A. No.</p> <p>15 Q. Have you ever performed calibration of</p> <p>16 software for an engine control unit for a vehicle?</p> <p>17 A. I'm sorry. Regarding the previous</p> <p>18 question, I want to clarify that. I have written</p> <p>19 software to do the work that I've done on</p> <p>20 emissions, but it's not software that went into a</p> <p>21 vehicle. If you could repeat your question.</p> <p>22 Q. Have you ever performed calibration of</p> <p>23 software for an automobile?</p> <p>24 A. No. Actually, I just remembered something</p> <p>25 else. I apologize. You were asking about my</p>	<p style="text-align: right;">Page 84</p> <p>1 A. Yeah. So there's specialized software for</p> <p>2 doing that. There's several ways, but at the</p> <p>3 lowest technical level, the binary image that's</p> <p>4 going to go into the engine, the specific values,</p> <p>5 the calibration values are inserted into that. And</p> <p>6 by inserted, I mean places where they would be –</p> <p>7 where the code would call upon them. The specific</p> <p>8 values are written to those places, so sort of a</p> <p>9 fill-in-the-blank type of thing.</p> <p>10 Q. What tools do calibrators use to calibrate</p> <p>11 software for diesel vehicles?</p> <p>12 A. I don't know the full tool set that</p> <p>13 they – that they would use. I know they've used</p> <p>14 software called Inca, which is also what I use to</p> <p>15 analyze the calibration data in this case.</p> <p>16 Q. What else?</p> <p>17 A. What else – what else did I use, or what</p> <p>18 else do engineers use?</p> <p>19 Q. What other tools do engineers use?</p> <p>20 A. In the calibration process, there's some</p> <p>21 software that I mentioned in my report that they</p> <p>22 use, a tool called Hex2Bin, which is for converting</p> <p>23 between formats, but those are all the specific</p> <p>24 tools that I know they use for sure.</p> <p>25 Q. What training do calibrators receive</p>
<p style="text-align: right;">Page 83</p> <p>1 students. I believe one of my students has done</p> <p>2 some work on automobiles independent of my research</p> <p>3 with him. I think his father owns a company that</p> <p>4 involves engines, but he was not involved in this</p> <p>5 work.</p> <p>6 Q. Have you overseen any of his work related</p> <p>7 to automobiles?</p> <p>8 A. No.</p> <p>9 Q. Can you explain the process by which</p> <p>10 emissions control software for a diesel passenger</p> <p>11 vehicle is calibrated?</p> <p>12 A. That's – that's not something that I – I</p> <p>13 should say no. I could not explain it to you.</p> <p>14 Q. I'm sorry. I think I interrupted you.</p> <p>15 A. I could not explain the full process to</p> <p>16 you.</p> <p>17 Q. Can you explain any part of the process?</p> <p>18 A. Yeah. I can explain the part that</p> <p>19 concerns the – you know, how the values are</p> <p>20 introduced and what role they play. What I can't</p> <p>21 tell you is exactly what's going on in every</p> <p>22 engineer's mind and what decisions they're making</p> <p>23 in every specific case during calibration.</p> <p>24 Q. Please explain how the values are</p> <p>25 introduced.</p>	<p style="text-align: right;">Page 85</p> <p>1 before they perform calibration work on diesel</p> <p>2 vehicles?</p> <p>3 MR. SHAEFFER: Object to the form.</p> <p>4 THE WITNESS: I don't know.</p> <p>5 BY MR. WORK-DEMBOWSKI:</p> <p>6 Q. How is calibration tested?</p> <p>7 A. I don't know.</p> <p>8 Q. How long does the process of calibrating</p> <p>9 the emissions control software on a diesel</p> <p>10 passenger vehicle take?</p> <p>11 A. My understanding from the data that I used</p> <p>12 in the report is that it takes months.</p> <p>13 Q. How many months?</p> <p>14 A. I don't know exactly.</p> <p>15 Q. Do you know how long the calibration of</p> <p>16 the emissions control software on the diesel Chevy</p> <p>17 Cruze took?</p> <p>18 A. No.</p> <p>19 Q. Do you understand that emissions control</p> <p>20 systems have many different functionalities that</p> <p>21 could affect the emissions that come out of the</p> <p>22 tailpipe?</p> <p>23 MR. SHAEFFER: Objection. Vague and ambiguous.</p> <p>24 THE WITNESS: I'm sorry. Could you restate?</p> <p>25 I'm trying to put together what you're asking.</p>

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<p style="text-align: right;">Page 86</p> <p>1 BY MR. WORK-DEMBOWSKI:</p> <p>2 Q. Do you have an understanding of whether</p> <p>3 the emissions control systems on diesel passenger</p> <p>4 vehicles have multiple functionalities that can</p> <p>5 affect the emissions that come out of the tailpipe?</p> <p>6 MR. SHAEFFER: Same objection.</p> <p>7 THE WITNESS: Yes.</p> <p>8 BY MR. WORK-DEMBOWSKI:</p> <p>9 Q. Do you understand that the multiple</p> <p>10 functions in diesel emissions control systems are</p> <p>11 interrelated with each other?</p> <p>12 A. I would agree with that statement.</p> <p>13 Q. And do you understand that the calibration</p> <p>14 of one aspect of the emissions controls could</p> <p>15 affect the performance of other aspects of the</p> <p>16 emissions controls as well as other aspects of the</p> <p>17 vehicle's behavior?</p> <p>18 MR. SHAEFFER: Object to the form.</p> <p>19 THE WITNESS: I would agree with that.</p> <p>20 BY MR. WORK-DEMBOWSKI:</p> <p>21 Q. And you would agree that a calibrator must</p> <p>22 consider the effect of any calibration change on</p> <p>23 the overall system performance, correct?</p> <p>24 MR. SHAEFFER: Same objection.</p> <p>25 THE WITNESS: I – I don't know what</p>	<p style="text-align: right;">Page 88</p> <p>1 A. I would think they consider whether it</p> <p>2 satisfies the particular goals of the calibration</p> <p>3 to make the vehicle function in a particular way.</p> <p>4 That's a general statement, but I couldn't give you</p> <p>5 all the specific factors or a checklist.</p> <p>6 Q. Dr. Levchenko, can you explain what an SCR</p> <p>7 catalyst looks like?</p> <p>8 MR. SHAEFFER: Object to the form.</p> <p>9 THE WITNESS: It's – it's a part of the</p> <p>10 emissions, but I couldn't draw one for you if</p> <p>11 that's what you're asking.</p> <p>12 BY MR. WORK-DEMBOWSKI:</p> <p>13 Q. Do you know what an SCR catalyst is made</p> <p>14 out of?</p> <p>15 A. I don't know its composition.</p> <p>16 Q. Do you know what materials are used in</p> <p>17 manufacturing an SCR catalyst?</p> <p>18 A. I don't know that.</p> <p>19 Q. Would you please get your first report and</p> <p>20 turn to Page 6. This is Exh bit Levchenko 1.</p> <p>21 Let's turn to Page 6, paragraph 11.</p> <p>22 A. Okay.</p> <p>23 Q. You wrote in paragraph 11 that the ECU is</p> <p>24 a specialized computer that is responsible for</p> <p>25 controlling nearly all aspects of engine operation.</p>
<p style="text-align: right;">Page 87</p> <p>1 instructions calibrators receive when they do their</p> <p>2 job.</p> <p>3 BY MR. WORK-DEMBOWSKI:</p> <p>4 Q. You don't know what a calibrator has to</p> <p>5 consider when performing calibration?</p> <p>6 A. I don't know the exact factors they</p> <p>7 consider.</p> <p>8 Q. You don't know any of the factors they</p> <p>9 consider?</p> <p>10 MR. SHAEFFER: Objection. Misstates prior</p> <p>11 testimony.</p> <p>12 THE WITNESS: I would disagree with that</p> <p>13 statement.</p> <p>14 BY MR. WORK-DEMBOWSKI:</p> <p>15 </p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22 Q. What other factors are you aware of as an</p> <p>23 expert in this case that calibrators take into</p> <p>24 consideration when they calibrate diesel emission</p> <p>25 software?</p>	<p style="text-align: right;">Page 89</p> <p>1 Did I read that correctly?</p> <p>2 A. I'm sorry. Are you referring to Page 11</p> <p>3 or paragraph 11?</p> <p>4 Q. Page 6, paragraph 11.</p> <p>5 A. And your question again if you don't mind?</p> <p>6 Q. Sure. In paragraph 11 of your first</p> <p>7 report, you wrote the ECU is a specialized computer</p> <p>8 that is responsible for controlling nearly all</p> <p>9 aspects of engine operation. Did you write that?</p> <p>10 A. Yes.</p> <p>11 Q. What aspects of engine operation does the</p> <p>12 ECU not control?</p> <p>13 A. I'm not an engine expert, so I don't know</p> <p>14 what all the aspects of engine operations there</p> <p>15 are.</p> <p>16 Q. In paragraph 11, you describe various</p> <p>17 aspects of things that the ECU can control. Where</p> <p>18 did the information come from that you wrote in</p> <p>19 paragraph 11?</p> <p>20 A. It comes from the software documentation</p> <p>21 as well as the reference book that I mentioned here</p> <p>22 called Diesel Engine Management Systems and</p> <p>23 Components, Bosch professional automotive</p> <p>24 information.</p> <p>25 Q. Were you aware – I'm sorry.</p>

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<p style="text-align: right;">Page 90</p> <p>1 A. I was going to say 2014 edition.</p> <p>2 Q. Were you aware of any of the information</p> <p>3 in paragraph 11 before you worked on this case?</p> <p>4 A. Yes.</p> <p>5 Q. Which parts of the information in</p> <p>6 paragraph 11 were you aware of before you worked on</p> <p>7 this case?</p> <p>8 A. I had read parts of the book I mentioned</p> <p>9 prior to this case, and I've looked at software</p> <p>10 documentation prior to this case, so all of them.</p> <p>11 Q. So in point A of paragraph 11, you wrote</p> <p>12 that the ECU controls the timing and amount of fuel</p> <p>13 injected into the cylinder which determines the</p> <p>14 amount of energy released in combustion and the</p> <p>15 characteristics of the combustion process. Did you</p> <p>16 write that?</p> <p>17 A. Yes.</p> <p>18 Q. How does injecting more fuel into the</p> <p>19 cylinder affect the characteristics of the</p> <p>20 combustion process?</p> <p>21 A. I'm not an automotive engineer, so I</p> <p>22 couldn't answer that question.</p> <p>23 Q. Well, do you know what – how injecting</p> <p>24 less fuel into the cylinder affects the combustion</p> <p>25 process?</p>	<p style="text-align: right;">Page 92</p> <p>1 injection timing affect the characteristic of the</p> <p>2 combustion process?</p> <p>3 A. I'm not – I'm not a diesel engineer, so I</p> <p>4 couldn't give you an authoritative answer on that.</p> <p>5 Q. Would you expect that injection timing</p> <p>6 would change in different driving conditions?</p> <p>7 A. This is outside of the scope of my report,</p> <p>8 so I don't know.</p> <p>9 Q. Well, it's written in your report, and</p> <p>10 that's why I'm asking you about it.</p> <p>11 A. You're asking specifically about how it</p> <p>12 would change. I'm just saying that this is an</p> <p>13 element that is controlled by an engine control</p> <p>14 unit.</p> <p>15 Q. And what impact does injection timing have</p> <p>16 on emissions?</p> <p>17 A. I know it does have an impact, but I'm not</p> <p>18 a – I'm not an engineer. It's outside of the</p> <p>19 scope of this report, so I couldn't answer that</p> <p>20 question.</p> <p>21 Q. So you did not analyze the injection</p> <p>22 timing for purposes of your analysis in this case?</p> <p>23 A. That's correct.</p> <p>24 Q. Even though injection timing has an impact</p> <p>25 on emissions?</p>
<p style="text-align: right;">Page 91</p> <p>1 MR. SHAEFFER: Objection. Asked and answered.</p> <p>2 THE WITNESS: I'm not – I'm not an automotive</p> <p>3 engineer, so I wouldn't be able to give you a</p> <p>4 detailed answer.</p> <p>5 BY MR. WORK-DEMBOWSKI:</p> <p>6 Q. Do you have any opinion about what amount</p> <p>7 of fuel you would expect to be injected into the</p> <p>8 cylinder on a vehicle like the Chevy diesel Cruze?</p> <p>9 A. I do not.</p> <p>10 Q. Does the amount of fuel that you would</p> <p>11 expect to be injected into the cylinder change</p> <p>12 across different driving conditions?</p> <p>13 MR. SHAEFFER: Object to the form.</p> <p>14 THE WITNESS: Yes.</p> <p>15 BY MR. WORK-DEMBOWSKI:</p> <p>16 Q. How?</p> <p>17 A. Well, the fuel – the amount of fuel</p> <p>18 injected is not constant all of the time. So</p> <p>19 depending on how fast you're going, acceleration</p> <p>20 and so on, the amount of fuel will change.</p> <p>21 Q. That's because in different driving</p> <p>22 conditions, the car needs different behavior,</p> <p>23 correct?</p> <p>24 A. Yes.</p> <p>25 Q. How about injection timing, how does</p>	<p style="text-align: right;">Page 93</p> <p>1 A. I don't know. So I should say – let me</p> <p>2 back up. I did not analyze injection timing in</p> <p>3 this case.</p> <p>4 Q. In point B, you wrote that the ECU</p> <p>5 controls the position of the throttle valve which</p> <p>6 determines the amount of fresh air used in</p> <p>7 combustion. Did you write that?</p> <p>8 A. I did.</p> <p>9 Q. How does changing the amount of fresh air</p> <p>10 used in combustion alter vehicle performance?</p> <p>11 A. Again, outside of the scope of the report,</p> <p>12 I don't know.</p> <p>13 Q. Under what driving conditions would you</p> <p>14 expect higher amounts of fresh air to be needed in</p> <p>15 combustion?</p> <p>16 A. Generally speaking, the greater the demand</p> <p>17 for torque, the more air would be consumed in order</p> <p>18 to combust the fuel. That's a very general</p> <p>19 characterization.</p> <p>20 Q. In point C of paragraph 11, you wrote that</p> <p>21 the ECU controls the position of the EGR valve,</p> <p>22 which determines the amount of exhaust gas diverted</p> <p>23 back into the cylinder air intake. Did you write</p> <p>24 that?</p> <p>25 A. I did.</p>

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<p style="text-align: right;">Page 94</p> <p>1 Q. What is the cylinder air intake?</p> <p>2 A. That's the air that's going to go into the</p> <p>3 cylinder.</p> <p>4 Q. What's the cylinder?</p> <p>5 A. The cylinder is where the combustion</p> <p>6 happens.</p> <p>7 Q. What is the role of the cylinder air</p> <p>8 intake in the function of the engine?</p> <p>9 A. It provides the air for the combustion of</p> <p>10 the engine.</p> <p>11 Q. In point D of paragraph 11, you wrote that</p> <p>12 the ECU controls the amount of DEF injected into</p> <p>13 the exhaust before entering the SCR catalyst, which</p> <p>14 determines how much of the NOx is converted into</p> <p>15 nitrogen gas and water vapor before leaving the</p> <p>16 tailpipe. Did you write that?</p> <p>17 A. I did.</p> <p>18 Q. What is DEF?</p> <p>19 A. Diesel exhaust fluid.</p> <p>20 Q. It's commonly called DEF, right?</p> <p>21 A. I don't know what it's commonly called.</p> <p>22 Q. What are the components of DEF?</p> <p>23 A. Again, I don't know. I can tell you it</p> <p>24 has a chemical that helps to reduce the amount of</p> <p>25 NOx.</p>	<p style="text-align: right;">Page 96</p> <p>1 controlling vehicle emissions. Did you write that?</p> <p>2 A. I did.</p> <p>3 Q. What's your basis for that statement?</p> <p>4 A. Basis is my understanding of these systems</p> <p>5 based on the software documentation and the Diesel</p> <p>6 Engine Management book.</p> <p>7 Q. Any other bases?</p> <p>8 A. Not that I can recall.</p> <p>9 Q. What factors influence the effectiveness</p> <p>10 of the EGR system?</p> <p>11 A. I don't know.</p> <p>12 Q. Does barometric pressure affect – excuse</p> <p>13 me.</p> <p>14 Does barometric pressure influence the</p> <p>15 effectiveness of the EGR system?</p> <p>16 A. I don't know.</p> <p>17 Q. Does environmental temperature?</p> <p>18 A. I don't know.</p> <p>19 Q. Does engine coolant temperature?</p> <p>20 A. I don't know.</p> <p>21 Q. Does the temperature of the exhaust?</p> <p>22 A. I don't know.</p> <p>23 Q. Does humidity?</p> <p>24 A. I don't know.</p> <p>25 Q. What about soot buildup?</p>
<p style="text-align: right;">Page 95</p> <p>1 Q. Do you know what that chemical is?</p> <p>2 A. I couldn't tell you for sure.</p> <p>3 Q. Is the amount of NOx conversion only</p> <p>4 controlled by the amount of DEF injected into the</p> <p>5 exhaust?</p> <p>6 A. My understanding is that it is not.</p> <p>7 Q. Are there other factors that can affect</p> <p>8 the conversion rate?</p> <p>9 A. I don't know, but I would expect there</p> <p>10 are.</p> <p>11 Q. Do you know what those other factors are?</p> <p>12 MR. SHAEFFER: Objection. Asked and answered.</p> <p>13 THE WITNESS: I don't.</p> <p>14 BY MR. WORK-DEMBOWSKI:</p> <p>15 Q. You don't know what any of them are?</p> <p>16 MR. SHAEFFER: Same objection.</p> <p>17 THE WITNESS: Again, I don't know what the</p> <p>18 factors are and how they affect exactly the NOx</p> <p>19 conversion.</p> <p>20 BY MR. WORK-DEMBOWSKI:</p> <p>21 Q. Let's move on to paragraph 12 on that same</p> <p>22 page of your first report.</p> <p>23 You wrote because EGR and SCR are two of</p> <p>24 the primary mechanisms used to control the emission</p> <p>25 of NOx, the ECU plays a critical role in</p>	<p style="text-align: right;">Page 97</p> <p>1 A. I don't know.</p> <p>2 Q. What about the composition of the fuel</p> <p>3 that's been burned in the engine?</p> <p>4 A. I don't know.</p> <p>5 Q. Do you know any factor that influences the</p> <p>6 effectiveness of the EGR system?</p> <p>7 A. Well, one factor is how the – how much</p> <p>8 the EGR valve is opened.</p> <p>9 Q. Anything else?</p> <p>10 A. That will determine how much exhaust gas</p> <p>11 is recirculated. I can't name you any other</p> <p>12 specific factors.</p> <p>13 Q. Okay. Well, you talked also in that</p> <p>14 sentence about the SCR system. What factors</p> <p>15 influence the effectiveness of the SCR system?</p> <p>16 A. Certainly the amount of diesel exhaust</p> <p>17 fluid injected.</p> <p>18 Q. Anything else?</p> <p>19 A. I can't name any others.</p> <p>20 Q. What about the temperature of the SCR</p> <p>21 catalyst?</p> <p>22 A. I don't know.</p> <p>23 Q. What about the temperature of the diesel</p> <p>24 exhaust fluid?</p> <p>25 A. I don't know.</p>

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<p style="text-align: right;">Page 98</p> <p>1 Q. How about the composition of the diesel 2 exhaust fluid?</p> <p>3 A. I don't know.</p> <p>4 Q. What about ambient temperature?</p> <p>5 A. I don't know.</p> <p>6 Q. Exhaust mass flow?</p> <p>7 A. I don't know.</p> <p>8 Q. The age of the catalyst?</p> <p>9 A. I don't know.</p> <p>10 Q. Anything else?</p> <p>11 A. Anything else what?</p> <p>12 Q. Is there anything else that influences the 13 effectiveness of the SCR system to your knowledge?</p> <p>14 A. I don't know.</p> <p>15 Q. On the same page, paragraph 13, and again, 16 this is in your first report, paragraph 13, you 17 wrote EGR offers a complex set of trade-offs, and 18 you refer to the figure that's at the top of the 19 next page, Page 7. The figure at the top of Page 7 20 includes three graphs, right?</p> <p>21 A. Uh-huh. Yes.</p> <p>22 Q. Thank you. These graphs are illustrative, 23 correct?</p> <p>24 A. Yes.</p> <p>25 Q. They are not based on data from the diesel</p>	<p style="text-align: right;">Page 100</p> <p>1 A. I know it, yes.</p> <p>2 Q. Do you know whether there are regulatory 3 emissions standards in the United States for carbon 4 monoxide?</p> <p>5 A. I do not.</p> <p>6 Q. Do you know whether or not there are 7 regulatory emissions standards in the United States 8 for hydrocarbons?</p> <p>9 MR. SHAEFFER: Object to the form.</p> <p>10 THE WITNESS: I do not.</p> <p>11 BY MR. WORK-DEMBOWSKI:</p> <p>12 Q. Do you know whether there are regulatory 13 emissions standards in the United States for 14 nitrogen oxides?</p> <p>15 MR. SHAEFFER: Same objection.</p> <p>16 THE WITNESS: My understanding is there are.</p> <p>17 BY MR. WORK-DEMBOWSKI:</p> <p>18 Q. You do not have an opinion about what a 19 reasonable level of emissions of hydrocarbons is, 20 do you?</p> <p>21 MR. SHAEFFER: Object to the form.</p> <p>22 THE WITNESS: I don't know what the legal 23 limits are for hydrocarbons, hydrocarbon emissions.</p> <p>24 BY MR. WORK-DEMBOWSKI:</p> <p>25 Q. I'm not asking about the legal limits. Do</p>
<p style="text-align: right;">Page 99</p> <p>1 Chevy Cruze vehicles that are at issue in this 2 case, are they?</p> <p>3 A. Not to my knowledge.</p> <p>4 Q. Can you please explain what the top graph 5 in the figure on Page 7 shows?</p> <p>6 A. So the top one shows the amount of the 7 specific chemicals shown or labeled with each curve 8 emitted as a function of exhaust gas recirculation.</p> <p>9 Q. What does CO mean in the top graph on 10 Page 7?</p> <p>11 A. I'm sorry. Could you repeat?</p> <p>12 Q. What does CO mean in the top graph in the 13 figure on Page 7?</p> <p>14 A. I believe it refers to carbon monoxide.</p> <p>15 Q. Do you know?</p> <p>16 A. I don't know for sure.</p> <p>17 Q. What does HC stand for in the top graph on 18 Page 7?</p> <p>19 A. I believe it refers to hydrocarbons.</p> <p>20 Q. Do you know?</p> <p>21 A. I don't know for sure.</p> <p>22 Q. What does NOx stand for in the top graph 23 on Page 7?</p> <p>24 A. Nitrogen oxides.</p> <p>25 Q. That one you know?</p>	<p style="text-align: right;">Page 101</p> <p>1 you have an opinion of what a reasonable level of 2 emissions is for hydrocarbons?</p> <p>3 MR. SHAEFFER: Same objection.</p> <p>4 THE WITNESS: I don't have a personal opinion 5 on that.</p> <p>6 BY MR. WORK-DEMBOWSKI:</p> <p>7 Q. Do you have an opinion about what a 8 reasonable level of emissions is for carbon 9 monoxide?</p> <p>10 MR. SHAEFFER: Object to the form.</p> <p>11 THE WITNESS: I do not have a personal opinion 12 on that.</p> <p>13 BY MR. WORK-DEMBOWSKI:</p> <p>14 Q. Do you have an opinion about what a 15 reasonable level of emissions is of NOx?</p> <p>16 MR. SHAEFFER: Object to the form.</p> <p>17 THE WITNESS: I don't have an opinion – a 18 personal opinion on how much NOx should be emitted.</p> <p>19 BY MR. WORK-DEMBOWSKI:</p> <p>20 Q. Do you have an expert opinion?</p> <p>21 A. I'm sorry. Say again.</p> <p>22 Q. Do you have an expert opinion of how much 23 NOx should be emitted?</p> <p>24 MR. SHAEFFER: Object to the form.</p> <p>25 THE WITNESS: You're saying the word should,</p>

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<p style="text-align: right;">Page 102</p> <p>1 and that could have several meanings. So I don't</p> <p>2 know what the legal limits are. I don't have a</p> <p>3 personal opinion about how much NOx should be</p> <p>4 emitted.</p> <p>5 BY MR. WORK-DEMBOWSKI:</p> <p>6 Q. What do you mean when you say a personal</p> <p>7 opinion?</p> <p>8 A. I mean I don't have a number in mind as I</p> <p>9 go about my day how much NOx cars should emit.</p> <p>10 Q. Do you have an opinion as an expert in</p> <p>11 this case about that?</p> <p>12 A. I do not have an expert opinion on the NOx</p> <p>13 limits, but there's a legal NOx limit, and you're</p> <p>14 saying the word should, which suggests some kind of</p> <p>15 a personal judgment. It's two different meanings.</p> <p>16 I don't have an opinion on the legal limits.</p> <p>17 BY MR. WORK-DEMBOWSKI:</p> <p>18 Q. Let's take a look again at the figure on</p> <p>19 Page 7, the middle graph. Can you please explain</p> <p>20 what the middle graph is in the figure on Page 7?</p> <p>21 A. Particulate emissions.</p> <p>22 Q. Please explain what the graph –</p> <p>23 A. I'm sorry. It's a function of particulate</p> <p>24 emissions. It shows the – I believe, the size,</p> <p>25 but I don't know for sure, as a function of exhaust</p>	<p style="text-align: right;">Page 104</p> <p>1 BY MR. WORK-DEMBOWSKI:</p> <p>2 Q. Do you have any opinions about what is a</p> <p>3 reasonable particulate size –</p> <p>4 MR. SHAEFFER: Same objection.</p> <p>5 BY MR. WORK-DEMBOWSKI:</p> <p>6 Q. – in the emissions from diesel passenger</p> <p>7 vehicles?</p> <p>8 MR. SHAEFFER: Apologies. Same objection.</p> <p>9 THE WITNESS: I do not.</p> <p>10 BY MR. WORK-DEMBOWSKI:</p> <p>11 Q. You recognize that balancing the</p> <p>12 trade-offs among these different types of</p> <p>13 emissions, carbon monoxide, hydrocarbons and NOx</p> <p>14 can be a complex task, correct?</p> <p>15 A. Correct.</p> <p>16 Q. And in your work for this case, you were</p> <p>17 only asked to look at software related to controls</p> <p>18 for NOx emissions, correct?</p> <p>19 A. I don't recall the exact tasking, but the</p> <p>20 context of diesel emissions is – it's about NOx</p> <p>21 emissions.</p> <p>22 Q. Why is that?</p> <p>23 A. It's what the – my prior work has been on</p> <p>24 in the How They Did It article, and that's what the</p> <p>25 cases seem to be about. I mean, again, this is</p>
<p style="text-align: right;">Page 103</p> <p>1 gas recirculation.</p> <p>2 Q. Do you know whether there are regulatory</p> <p>3 emissions standards that govern the size of</p> <p>4 particulate emissions in exhaust from diesel</p> <p>5 passenger vehicles in the United States?</p> <p>6 MR. SHAEFFER: Object to the form.</p> <p>7 THE WITNESS: I don't know.</p> <p>8 BY MR. WORK-DEMBOWSKI:</p> <p>9 Q. Do you know whether there are regulatory</p> <p>10 emissions standards in the United States of any</p> <p>11 kind that relate to particulate emissions in the</p> <p>12 exhaust from diesel passenger vehicles?</p> <p>13 MR. SHAEFFER: Same objection.</p> <p>14 THE WITNESS: I don't know what the emissions</p> <p>15 standards are for particulate emissions.</p> <p>16 BY MR. WORK-DEMBOWSKI:</p> <p>17 Q. Do you have an opinion on what reasonable</p> <p>18 levels of particulate emissions are from diesel</p> <p>19 passenger vehicles?</p> <p>20 MR. SHAEFFER: Object to form.</p> <p>21 THE WITNESS: I don't have an opinion on and</p> <p>22 I'm not offering a legal opinion on the legal</p> <p>23 limits on it. I don't have a personally held</p> <p>24 opinion on particulate emissions.</p> <p>25</p>	<p style="text-align: right;">Page 105</p> <p>1 cases described in the popular media about what –</p> <p>2 what is diesel emissions cheating and so on.</p> <p>3 Q. Do you have an understanding of why the</p> <p>4 focus is on NOx when it comes to diesel vehicles?</p> <p>5 A. I don't have an opinion on that.</p> <p>6 Q. You were not asked in this case about</p> <p>7 possible trade-offs between NOx emissions and the</p> <p>8 other emissions that are identified in the figure</p> <p>9 on Page 7 of your first report; is that correct?</p> <p>10 A. I was not specifically asked to look at</p> <p>11 emissions of these other things you mentioned.</p> <p>12 Q. And you don't have any opinion – you're</p> <p>13 not offering any opinion about the trade-off</p> <p>14 between NOx emissions and the other emissions</p> <p>15 identified on Page 7?</p> <p>16 A. That's correct. I'm not offering such an</p> <p>17 opinion.</p> <p>18 Q. Does the complex set of trade-offs for EGR</p> <p>19 work differently in different vehicle models?</p> <p>20 A. I would imagine so, but I don't know.</p> <p>21 Q. Does the complex set of trade-offs for EGR</p> <p>22 work differently in different operating conditions?</p> <p>23 A. I don't know.</p> <p>24 Q. Does the complex set of trade-offs for EGR</p> <p>25 work differently at different altitudes?</p>

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<p style="text-align: right;">Page 106</p> <p>1 A. I don't know.</p> <p>2 Q. Does the complex set of trade-offs for EGR</p> <p>3 work differently at different ambient humidity</p> <p>4 levels?</p> <p>5 A. I don't know.</p> <p>6 Q. Does the complex set of trade-offs for EGR</p> <p>7 work differently at different ambient temperatures?</p> <p>8 A. I don't know.</p> <p>9 Q. Do you know why a vehicle manufacturer</p> <p>10 might want to use less EGR at high ambient</p> <p>11 temperatures?</p> <p>12 MR. SHAEFFER: Object to the form.</p> <p>13 THE WITNESS: I don't know.</p> <p>14 BY MR. WORK-DEMBOWSKI:</p> <p>15 Q. Does avoiding soot formation play a role</p> <p>16 in that decision?</p> <p>17 A. Maybe. I don't know.</p> <p>18 Q. What negative effects could soot buildup</p> <p>19 have on vehicle performance?</p> <p>20 A. I don't know.</p> <p>21 Q. Moving on in your report to the next</p> <p>22 paragraph, No. 14, you wrote here that the ECU</p> <p>23 functions by collecting data from sensors</p> <p>24 throughout the vehicle, calculating an appropriate</p> <p>25 response and sending signals to actuators. Did you</p>	<p style="text-align: right;">Page 108</p> <p>1 Q. What is the glow plug control unit?</p> <p>2 A. I don't know.</p> <p>3 Q. What would happen if I took the glow plug</p> <p>4 control unit off a diesel Chevy Cruze?</p> <p>5 MR. SHAEFFER: I'm going to object to this line</p> <p>6 of questioning as outside the scope of the opinions</p> <p>7 offered in this report, but you can answer.</p> <p>8 THE WITNESS: I don't know.</p> <p>9 MR. WORK-DEMBOWSKI: Peter, that was a coaching</p> <p>10 objection. I would appreciate it if you would not</p> <p>11 make those.</p> <p>12 MR. SHAEFFER: I can't make beyond the scope</p> <p>13 objections?</p> <p>14 MR. WORK-DEMBOWSKI: You can object to the</p> <p>15 form, and you move on.</p> <p>16 BY MR. WORK-DEMBOWSKI:</p> <p>17 Q. Dr. Levchenko, have you ever driven a</p> <p>18 diesel passenger car?</p> <p>19 A. If I have, I don't have a specific memory</p> <p>20 of that.</p> <p>21 Q. Have you ever been inside a diesel</p> <p>22 passenger car?</p> <p>23 A. Yes.</p> <p>24 Q. When?</p> <p>25 A. I mean, a couple years ago probably. I</p>
<p style="text-align: right;">Page 107</p> <p>1 write that?</p> <p>2 A. I did.</p> <p>3 Q. You refer to a figure that's on the next</p> <p>4 page, Page 8, correct?</p> <p>5 A. That's right.</p> <p>6 Q. Looking at the figure at the top of</p> <p>7 Page 8, what role does the air mass sensor play in</p> <p>8 vehicle performance?</p> <p>9 A. I don't know.</p> <p>10 Q. How about the role of the boost pressure</p> <p>11 sensor?</p> <p>12 A. I don't know.</p> <p>13 Q. Do you know what the lambda oxygen sensor</p> <p>14 is?</p> <p>15 A. I don't know.</p> <p>16 Q. Do you know where the lambda oxygen sensor</p> <p>17 is located in the model year 2014 diesel Chevy</p> <p>18 Cruze?</p> <p>19 A. I do not.</p> <p>20 Q. Do you know where it's located in the 2015</p> <p>21 diesel Chevy Cruze?</p> <p>22 A. I do not.</p> <p>23 Q. Do you know if it exists in the 2014 and</p> <p>24 2015 diesel Chevy Cruze?</p> <p>25 A. I don't know.</p>	<p style="text-align: right;">Page 109</p> <p>1 know I have some friends who have diesel cars, so I</p> <p>2 have ridden in those cars.</p> <p>3 Q. Do you remember what model car it was?</p> <p>4 A. No.</p> <p>5 Q. Have you ever been in a Chevrolet Cruze</p> <p>6 diesel vehicle?</p> <p>7 A. No, not to my knowledge.</p> <p>8 Q. How does the combustion process in a</p> <p>9 diesel engine differ from the combustion process in</p> <p>10 a gasoline engine?</p> <p>11 MR. SHAEFFER: Object to the form.</p> <p>12 THE WITNESS: Well, again, my report is not</p> <p>13 really about combustion, but this question I can</p> <p>14 answer based on – my knowledge is that it's</p> <p>15 ignited by – in a gasoline engine, combustion is</p> <p>16 initiated by a spark. That is not the case in a</p> <p>17 diesel engine.</p> <p>18 BY MR. WORK-DEMBOWSKI:</p> <p>19 Q. Any other differences?</p> <p>20 A. There are other differences, too, but</p> <p>21 that's the one – the most obvious one that comes</p> <p>22 to mind.</p> <p>23 Q. Does the combustion process in a diesel</p> <p>24 engine produce more NOx on average than the</p> <p>25 combustion process in a gasoline engine?</p>

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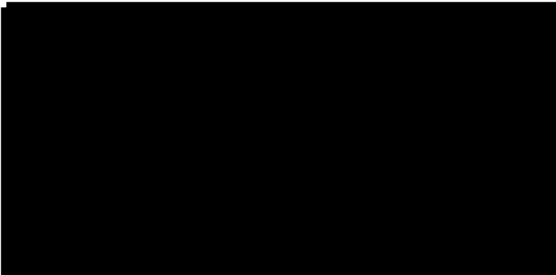
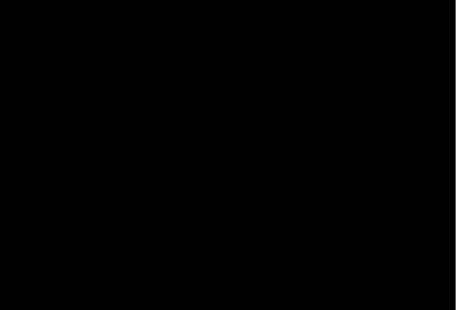
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<p style="text-align: right;">Page 110</p> <p>1 MR. SHAEFFER: Object to form.</p> <p>2 THE WITNESS: Again, this is outside of my</p> <p>3 report. I've been asked to look at the software of</p> <p>4 these vehicles, not compare diesel and gasoline</p> <p>5 engines, but I can tell you based on my prior</p> <p>6 knowledge that that is the case. And again, this</p> <p>7 is a very general statement.</p> <p>8 BY MR. WORK-DEMBOWSKI:</p> <p>9 Q. That was a very long response to a yes or</p> <p>10 no question. I'm going to try my question again.</p> <p>11 Does the combustion process in a diesel</p> <p>12 engine produce more NOx on average than the</p> <p>13 combustion process in a gasoline engine?</p> <p>14 MR. SHAEFFER: Same objection.</p> <p>15 THE WITNESS: I believe in general, that</p> <p>16 statement is correct. Now, looking at specific</p> <p>17 vehicles is a different thing.</p> <p>18 BY MR. WORK-DEMBOWSKI:</p> <p>19 Q. Do you know why that is?</p> <p>20 MR. SHAEFFER: Same objection.</p> <p>21 THE WITNESS: I don't know exactly why.</p> <p>22 BY MR. WORK-DEMBOWSKI:</p> <p>23 Q. Maybe we can turn to something that's a</p> <p>24 little closer to your wheelhouse.</p> <p>25 What is the processor chip that's in the</p>	<p style="text-align: right;">Page 112</p> <p>1 THE WITNESS: I do not.</p> <p>2 MR. WORK-DEMBOWSKI: I'm at a bit of a breaking</p> <p>3 point here. We could take a break for lunch if</p> <p>4 that would work, or we can go ahead and plow</p> <p>5 forward a little longer.</p> <p>6 MR. SHAEFFER: Sorry. 15 more minutes would be</p> <p>7 about an hour. Do you have a 15-minute chunk, or</p> <p>8 would it probably take more time than that?</p> <p>9 MR. WORK-DEMBOWSKI: I have a feeling it's</p> <p>10 going to take more time than that.</p> <p>11 MR. SHAEFFER: I would – I would recommend</p> <p>12 maybe we just break for lunch then and come back.</p> <p>13 MR. WORK-DEMBOWSKI: That would be my</p> <p>14 preference. How long should we break for?</p> <p>15 THE VIDEOGRAPHER: We're going off the video</p> <p>16 record. The time is now 17:12 UTC.</p> <p>17 (Whereupon, a lunch break was</p> <p>18 taken.)</p> <p>19 THE VIDEOGRAPHER: We are back on the video</p> <p>20 record. The time is now 18:02 UTC. Go ahead.</p> <p>21 BY MR. WORK-DEMBOWSKI:</p> <p>22 Q. Welcome back, Dr. Levchenko. Would you</p> <p>23 please find the envelope labeled No. 6 that we sent</p> <p>24 to you, and I will ask my colleague to post tab 6</p> <p>25 so that it becomes Levchenko Exhibit 6 on the</p>
<p style="text-align: right;">Page 111</p> <p>1 ECU used on the model year 2014 diesel Chevy Cruze</p> <p>2 vehicle?</p> <p>3 A. I don't know the exact model. My</p> <p>4 understanding is that the EDC17 uses an Infineon</p> <p>5 processor. I don't remember the exact model</p> <p>6 number.</p> <p>7 Q. Do you know if it's the same for the 2014</p> <p>8 and 2015 diesel Chevy Cruze?</p> <p>9 A. I do not.</p> <p>10 Q. Do you know what the rated processing</p> <p>11 speed of the chip in the EDC17 in the diesel Cruze</p> <p>12 vehicles is?</p> <p>13 A. I don't recall that right now.</p> <p>14 Q. Do you know how much RAM the ECU used in</p> <p>15 the 2014 and 2015 diesel Cruze vehicles has?</p> <p>16 A. I don't recall that right now. I'm sure</p> <p>17 I've seen it somewhere.</p> <p>18 Q. Do you know what percentage of the</p> <p>19 available RAM is used in normal operation by the</p> <p>20 ECU in the model year 2014 diesel Chevy Cruze?</p> <p>21 MR. SHAEFFER: Object to the form.</p> <p>22 THE WITNESS: I do not.</p> <p>23 BY MR. WORK-DEMBOWSKI:</p> <p>24 Q. How about in the 2015?</p> <p>25 MR. SHAEFFER: Same objection.</p>	<p style="text-align: right;">Page 113</p> <p>1 Box.com interface.</p> <p>2 Exhibit 6 is a copy of one of the articles</p> <p>3 that's on your list of publications, right?</p> <p>4 A. Uh-huh. Yes.</p> <p>5 Q. This is the article titled How They Did</p> <p>6 It: An Analysis of Emission Defeat Devices in</p> <p>7 Modern Automobiles, correct?</p> <p>8 A. Yes.</p> <p>9 Q. You're listed as one of the seven authors</p> <p>10 of this article?</p> <p>11 A. That's right.</p> <p>12 Q. How was the order of the authors decided</p> <p>13 for how they're listed at the top of the article?</p> <p>14 A. It was a rather complicated way of doing</p> <p>15 this kind of thing. So it's usually first students</p> <p>16 in order of contribution. Then usually post-docs</p> <p>17 and other contributors and then faculty usually in</p> <p>18 kind of reverse order. Basically the last author</p> <p>19 would be the advisor of the first author. In this</p> <p>20 case, the order got rearranged by the first author</p> <p>21 who was submitting it. Basically that's the author</p> <p>22 order, students first, faculty last.</p> <p>23 Q. And Mr. Li you said was your student,</p> <p>24 correct?</p> <p>25 A. That's right. He is a student of myself</p>

<p style="text-align: right;">Page 114</p> <p>1 and Stefan Savage.</p> <p>2 Q. What about Felix Domke?</p> <p>3 A. He's not a student. He's an independent</p> <p>4 packer in Germany who had some early work on</p> <p>5 Vo kswagen defeat devices. So we ended up</p> <p>6 partnering with him to work on this paper.</p> <p>7 Q. What was your role in writing this paper,</p> <p>8 Exh bit 6?</p> <p>9 A. So I supervised my student, and I wrote</p> <p>10 parts of the introduction, background and really</p> <p>11 parts of Section 4 describing the defeat devices,</p> <p>12 describing the Volkswagen defeat device. My German</p> <p>13 colleagues did most of the work on Section 5 and 6.</p> <p>14 Then again, our side, my student and myself and my</p> <p>15 colleague worked on some of the analysis of the</p> <p>16 PDFs.</p> <p>17 Q. When you say analysis of the PDFs, what do</p> <p>18 you mean?</p> <p>19 A. So this is what's shown in Table 2, I</p> <p>20 believe. I think it's -- I believe it's mentioned</p> <p>21 in -- it's referenced in Section 6, but I don't</p> <p>22 have it exactly. This is an analysis of the</p> <p>23 various software manuals much like the one that I</p> <p>24 was using for this and which systems used the</p> <p>25 signal, the acoustic condition signal for the</p>	<p style="text-align: right;">Page 116</p> <p>1 A. So when -- when this story first broke of</p> <p>2 Volkswagen emissions cheating, we -- we knew that</p> <p>3 the systems were software systems, that basically</p> <p>4 all of the stuff amounted to software. We had some</p> <p>5 experience -- some of my colleagues had experience</p> <p>6 working with vehicles. We all had experience doing</p> <p>7 reverse engineering and security analysis.</p> <p>8 So we got curious and thought well, how</p> <p>9 much can we find out about this because this was an</p> <p>10 unusual case. This is a -- as I mentioned already,</p> <p>11 in computer security, we deal with adversarial</p> <p>12 relationships, and here the adversary is, in</p> <p>13 effect, the manufacturer. They're trying to</p> <p>14 conceal a feature or cause the system to behave</p> <p>15 differently at kind of back door.</p> <p>16 So it was very interesting for us in that</p> <p>17 regard, and so we started looking at it. This was</p> <p>18 myself, my student and my colleague, Stefan Savage.</p> <p>19 And at some point, we came to know that my German</p> <p>20 colleagues were also working on a similar problem,</p> <p>21 so we ended up working together on it.</p> <p>22 Q. Did you call them, or did they call you?</p> <p>23 A. It was at a conference. You know, at a</p> <p>24 conference, we're just milling about, you know,</p> <p>25 what are you working on, what am I working on. We</p>
<p style="text-align: right;">Page 115</p> <p>1 Volkswagen defeat device.</p> <p>2 Q. What else did you do?</p> <p>3 A. I mean, those are in rough outline the</p> <p>4 parts I worked on. I don't remember exactly.</p> <p>5 Usually with a paper like this, it's a team effort.</p> <p>6 We all go through all parts of it. So some people</p> <p>7 certainly make primary contributions to some parts,</p> <p>8 but we're all looking over all of it.</p> <p>9 Q. Who came up with idea of performing the</p> <p>10 analysis that is described in this article,</p> <p>11 Exh bit 6?</p> <p>12 A. So there are several analyses done here.</p> <p>13 There's analysis of the software manuals that, you</p> <p>14 know, illustrate what the defeat device is. So</p> <p>15 that's something that we came up with. There is</p> <p>16 the -- the curves themselves, this is the specific</p> <p>17 test cycles where, I believe, identified first by</p> <p>18 Felix, and then my German colleagues worked on</p> <p>19 that.</p> <p>20 There's the curve diff analysis, which is</p> <p>21 a tool for extracting this information. That's my</p> <p>22 German colleagues. The PDF analysis, as I already</p> <p>23 mentioned, was our side, yeah.</p> <p>24 Q. How did you get involved with this group</p> <p>25 to prepare this article?</p>	<p style="text-align: right;">Page 117</p> <p>1 realized we were both working on a similar thing.</p> <p>2 Q. And how did Felix Domke get into that</p> <p>3 conversation?</p> <p>4 A. He is somebody my German colleagues had</p> <p>5 talked to. I don't know how that contact was</p> <p>6 initiated, but by the time we partnered with Moritz</p> <p>7 and Thorsten, he was sort of part of the German</p> <p>8 team.</p> <p>9 Q. Is there anything in the article that is</p> <p>10 Exh bit 6 that you disagree with?</p> <p>11 A. I don't think so. It's been a while, but</p> <p>12 certainly I've never disagreed with any specific</p> <p>13 thing in this article.</p> <p>14 Q. Do you stand behind the methodology that's</p> <p>15 discussed in the article?</p> <p>16 A. I do.</p> <p>17 Q. Is there anything that you would change</p> <p>18 about the work that was done for the article?</p> <p>19 A. No, I don't think so. I mean, we can</p> <p>20 always make something better, but there's nothing</p> <p>21 that I would change in the methodology.</p> <p>22 Q. The article is titled Emission -- An</p> <p>23 Analysis of Emission Defeat Devices in Modern</p> <p>24 Automobiles. What definition of defeat devices do</p> <p>25 you understand is reflected in this article?</p>

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<p style="text-align: right;">Page 118</p> <p>1 A. So at the time we wrote it, we were not 2 operating with the legal definition. In our 3 earlier questioning, I made it a point to say that 4 defeat devices has a specific legal meaning. At 5 the time we wrote this article, we mean it in 6 the – in the – not in the legal sense, but in the 7 common sense, but at the time, of course, also what 8 was inside the Volkswagen vehicles was already 9 called a defeat device by the EPA. 10 But to answer your question, the 11 definition is similar to or the same as what I'm 12 using. I'll try to go through the article and find 13 how we specifically define it, but it's the same 14 idea, something that allows a vehicle to behave one 15 way during an emissions test differently. During 16 regular driving, they're substantially similar 17 conditions. 18  19 20 21 22 23 24 25</p>	<p style="text-align: right;">Page 120</p> <p>1 Is it your understanding that that is the 2 definition of defeat device that you and your 3 coauthors used in the article that is Exh bit 6? 4 A. Yeah, it is. I think what's missing from 5 this definition is how it performs on a test cycle. 6 I believe that's part of the – also part of the 7 EPA definition. Again, I'm not going there, but 8 that is a general description for somebody who has 9 not heard of the term defeat device or might not 10 know what it means. 11 Q. Well, the majority of that definition I 12 just read is in quotation marks. 13 A. Yeah, it is. 14 Q. Is it your understanding that that is a 15 direct quotation from the EPA definition? 16 A. That is what I believe to be the case, 17 yeah. 18 Q. Is that a complete definition of a defeat 19 device? 20 A. It's not a complete definition. So the 21 definition I've used in my report has to do with 22 the difference between performance during a test 23 cycle versus normal driving let's say. So this 24 definition that you quoted does not address that 25 particular issue, but I believe in general spirit,</p>
<p style="text-align: right;">Page 119</p> <p>1  2 3 4 5 6 7 8 9 10 Q. Okay. And the definition that you used in 11 the paper, what's the source for that definition? 12 A. I'd have to look through the paper. I 13 don't remember if we cited a specific source or 14 whether we referred to – or offered a general 15 definition under which we would be operating. 16 Q. On Exhibit 6 on Page 1 towards the bottom 17 left, the second paragraph after the label 18 introduction, the text says at the heart of the 19 scandal is Volkswagen's use of a defeat device 20 defined by the EPA as any device that reduces the 21 effectiveness of the emission control system under 22 conditions which may reasonably be expected to be 23 encountered in normal vehicle operation and use 24 with exceptions for starting the engine, emergency 25 vehicles and to prevent accidents.</p>	<p style="text-align: right;">Page 121</p> <p>1 it is the same. 2 Q. And what's the basis for that belief? 3 A. I was one of the authors of the article. 4 When we wrote it, that is what we meant. 5 Q. But you didn't write that in the article? 6 A. You mean that phrase? 7 Q. You didn't write any different definition 8 in the article, sir. 9 A. We were defining it. Again, this was not 10 a legal definition. We're offering – we're giving 11 a layperson's definition for what a defeat device 12 would be for the reader of this article. 13 Q. Okay. Can you turn to Page 5 of 14 Exhibit 6. At the bottom right-hand corner of 15 Page 5, there's a footnote No. 1. Is that the 16 definition of defeat device that you used when 17 writing this article? 18 A. So again, the definition that we use is 19 informal. That is the quote, obviously from the 20 U.S. Code of Federal Regulations. That is, I 21 believe, the legal definition of a defeat device. 22 When we were writing this paper, we're not 23 examining the Volkswagen defeat device with respect 24 to the specific legal definition, but using the 25 legal definition to illustrate the general idea of</p>

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<p style="text-align: right;">Page 122</p> <p>1 what we mean. The basic elements of what I'm</p> <p>2 ta king about are present there, which is are you</p> <p>3 modifying the behavior, and this behavior is not</p> <p>4 present or is not observed during an emissions</p> <p>5 test.</p> <p>6 Q. The article, so this is Exh bit 6, the How</p> <p>7 They Did it article, discusses what's described as</p> <p>8 new static analysis firmware forensics techniques</p> <p>9 that allow the user to automatically identify known</p> <p>10 defeat devices and confirm their function. Is that</p> <p>11 correct?</p> <p>12 A. That sounds right. I'm not sure which</p> <p>13 part I'm reading from.</p> <p>14 Q. Look at the first page of your articles.</p> <p>15 It's the left-hand column, second paragraph of the</p> <p>16 abstract, the second sentence.</p> <p>17 A. I see it. Yes.</p> <p>18 Q. So there was new static analysis firmware</p> <p>19 forensic techniques that were created for this</p> <p>20 article, correct?</p> <p>21 A. That's correct.</p> <p>22 Q. The static analysis tool is what the</p> <p>23 article calls curve diff, correct, c-u-r-v-e,</p> <p>24 d-i-f-f?</p> <p>25 A. That's correct.</p>	<p style="text-align: right;">Page 124</p> <p>1 A. In our field, usually it's the first</p> <p>2 author who's usually a student who does the</p> <p>3 presentation.</p> <p>4 Q. Did you attend this symposium?</p> <p>5 A. I did.</p> <p>6 Q. Did you attend Mr. Contag's presentation</p> <p>7 of this article?</p> <p>8 A. To be honest, I don't remember.</p> <p>9 Q. Are you aware that in his presentation at</p> <p>10 the symposium, Mr. Contag told the audience that</p> <p>11 what you can do now is to take a firmware image,</p> <p>12 put it into a verification system, and two minutes</p> <p>13 after you get out results of whether the car is in</p> <p>14 compliance or not?</p> <p>15 MR. SHAEFFER: Object to the form.</p> <p>16 THE WITNESS: Sorry. Are you asking me whether</p> <p>17 I know that he said that or not?</p> <p>18 BY MR. WORK-DEMBOWSKI:</p> <p>19 Q. Do you recall whether he said that or not?</p> <p>20 A. I don't recall.</p> <p>21 Q. Do you agree with that statement?</p> <p>22 A. I would say it's – the tool is specific</p> <p>23 to the Vo kswagen defeat device, not to all</p> <p>24 possible defeat devices or cycle beating</p> <p>25 mechanisms.</p>
<p style="text-align: right;">Page 123</p> <p>1 Q. And that static analysis tool can be run</p> <p>2 across firmware images, right?</p> <p>3 A. That's correct.</p> <p>4 Q. When you and your coauthors wrote this</p> <p>5 article, you only analyzed firmware images from</p> <p>6 Vo kswagen and Chrysler Fiat vehicles, correct?</p> <p>7 A. Let me check. We have this on a table.</p> <p>8 To be honest, I see the model, the vehicle models.</p> <p>9 I don't know if all of them are Volkswagen brands,</p> <p>10 but in general, the analysis that we did was about</p> <p>11 a Vo kswagen vehicle and a Chrysler Fiat vehicle.</p> <p>12 Q. You did not analyze the software of the</p> <p>13 Chevy Cruze diesel vehicles at issue in this case</p> <p>14 for purposes of the article in Exhibit 6?</p> <p>15 A. That's correct.</p> <p>16 Q. The How They Did It article was presented</p> <p>17 in 2017 at the IEEE Symposia on Security and</p> <p>18 Privacy, correct?</p> <p>19 A. That's correct.</p> <p>20 Q. You're not the person who presented it,</p> <p>21 though?</p> <p>22 A. No.</p> <p>23 Q. Moritz Contag presented it?</p> <p>24 A. That's correct, the first author.</p> <p>25 Q. Why didn't you present it?</p>	<p style="text-align: right;">Page 125</p> <p>1 Q. So you did not use the same verification</p> <p>2 tool on the diesel Cruze for this case as you used</p> <p>3 in writing the How They Did It paper; is that</p> <p>4 correct?</p> <p>5 A. Yeah, that's correct. I want to be clear</p> <p>6 that the curve diff tool is a static analysis tool,</p> <p>7 but it's designed to look specific for the VW</p> <p>8 defeat device and specifically the use of the</p> <p>9 curves that they used. That's why it's called</p> <p>10 curve diff. And the way we use the tool in the</p> <p>11 paper is to do a longitudinal analysis of, I</p> <p>12 believe, several hundred firmware images to</p> <p>13 understand how the defeat device evolved with time.</p> <p>14 That is not the tasking for this report.</p> <p>15 For this report, I was asked to look at two</p> <p>16 specific model years, so there's really no reason</p> <p>17 to use curve diff on this.</p> <p>18 Q. Just to make sure I'm clear and I</p> <p>19 understand your answer, you did not analyze any</p> <p>20 firmware images from the diesel Chevy Cruze using</p> <p>21 curve diff?</p> <p>22 A. That's correct.</p> <p>23 Q. Have you ever applied the curve diff tool</p> <p>24 to vehicles from any other manufacturer?</p> <p>25 A. No, and I wouldn't because it's, again,</p>

<p style="text-align: right;">Page 126</p> <p>1 designed specifically for VW defeat device. We</p> <p>2 didn't use curve diff for the Fiat Chrysler, Fiat</p> <p>3 500X.</p> <p>4 Q. When you – can you please turn to Page 3</p> <p>5 of the article. In the left-hand column near the</p> <p>6 bottom, there's a paragraph that starts with bold</p> <p>7 letters SCR.</p> <p>8 A. Okay.</p> <p>9 Q. The final sentence in that paragraph says</p> <p>10 that except for results reported in Table 2, this</p> <p>11 paper does not cover defeat devices that manipulate</p> <p>12 SCR. Did you write that?</p> <p>13 A. I don't remember who wrote that specific</p> <p>14 sentence.</p> <p>15 Q. Is it a correct statement?</p> <p>16 A. I believe so.</p> <p>17 Q. And you talked about Table 2 earlier. I</p> <p>18 believe you said you were involved in the assembly</p> <p>19 of Table 2; is that correct?</p> <p>20 A. Yeah.</p> <p>21 Q. If you could turn to Page 14, please,</p> <p>22 that's where Table 2 is. Are you on Page 14?</p> <p>23 A. I am.</p> <p>24 Q. Can you please explain which of the</p> <p>25 results in Table 2 relate to SCR?</p>	<p style="text-align: right;">Page 128</p> <p>1 Roman Numeral 4 defeat devices?</p> <p>2 A. Uh-huh.</p> <p>3 Q. And under that, the second sentence of it</p> <p>4 says conceptually a defeat device has two</p> <p>5 components, monitor, determine if observed</p> <p>6 conditions rule out an emissions test and</p> <p>7 modify/alter vehicle behavior when not under test.</p> <p>8 A. Uh-huh.</p> <p>9 Q. Do you agree with those statements?</p> <p>10 A. That's the definition we used for this</p> <p>11 article. Since writing that, I believe the</p> <p>12 definition of a cycle beating mechanism is broader.</p> <p>13 It doesn't have that explicit detection signal.</p> <p>14 The Volkswagon one had a specific signal which told</p> <p>15 you if you were being tested or not. So this</p> <p>16 definition really, I would say, is more narrow and</p> <p>17 applies to the Volkswagen defeat device that we</p> <p>18 were analyzing.</p> <p>19 Q. So is it not your opinion that every</p> <p>20 defeat device has these two components that are</p> <p>21 listed in your article?</p> <p>22 A. That is correct.</p> <p>23 Q. In this case, you do not have an</p> <p>24 opinion – it is not your opinion, excuse me, that</p> <p>25 the diesel Chevy Cruze contains the first element</p>
<p style="text-align: right;">Page 127</p> <p>1 A. I believe the SCR FFC module has to do</p> <p>2 with SCR.</p> <p>3 Q. And how many of the models or versions</p> <p>4 that you looked at as reflected in Table 2 include</p> <p>5 SCR FFC?</p> <p>6 A. I see two.</p> <p>7 Q. Is it fair to say that SCR technology was</p> <p>8 not the focus of the How They Did It article?</p> <p>9 MR. SHAEFFER: Objection to form.</p> <p>10 THE WITNESS: The focus of the How They Did It</p> <p>11 article were – I believe the vehicles had – well,</p> <p>12 no. The NSC was in the Fiat. Actually, no. Let</p> <p>13 me backtrack.</p> <p>14 So the main focus was really on the</p> <p>15 detection mechanism to detect the test cycle. That</p> <p>16 mechanism was used throughout the ECU to alter the</p> <p>17 behavior of multiple systems. So the article</p> <p>18 certainly applies to the SCR, whatever the behavior</p> <p>19 modification was in the SCR system as much as to</p> <p>20 any other system.</p> <p>21 BY MR. WORK-DEMBOWSKI:</p> <p>22 Q. You referred to the focus being really on</p> <p>23 the detection mechanism, and I'd like to follow up</p> <p>24 on that. If you could turn to Page 5, please, in</p> <p>25 the article, in the right-hand column, there's a</p>	<p style="text-align: right;">Page 129</p> <p>1 of monitoring to identify when the vehicle is being</p> <p>2 tested; is that correct?</p> <p>3 MR. SHAEFFER: Object to the form.</p> <p>4 THE WITNESS: I would say that there is no</p> <p>5 explicit signal as there was in the Volkswagen case</p> <p>6 as either zero or 1 based on whether or not the ECU</p> <p>7 thinks it's going through a test cycle or not. How</p> <p>8 you can – there's no explicit signal, but then how</p> <p>9 you characterize determining where a ruling out an</p> <p>10 emissions test is – you know, can be applied more</p> <p>11 or less strictly. So I wouldn't say that the</p> <p>12 mechanisms I described in the report absolutely do</p> <p>13 not fit that definition, but I will say there is no</p> <p>14 signal as there was with the VW defeat device.</p> <p>15 BY MR. WORK-DEMBOWSKI:</p> <p>16 Q. There's no signal in the diesel Chevy</p> <p>17 Cruze that identifies when the vehicle is or is not</p> <p>18 on a test. Is that what you're saying?</p> <p>19 MR. SHAEFFER: Objection. Asked and answered.</p> <p>20 THE WITNESS: I did not find such a signal.</p> <p>21 BY MR. WORK-DEMBOWSKI:</p> <p>22 Q. Did you look for one?</p> <p>23 A. I think I probably did, but I don't</p> <p>24 remember the – that specific process.</p> <p>25 Q. You used the word a few minutes ago the –</p>

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<p style="text-align: right;">Page 130</p> <p>1 I think you said the acoustic signal or maybe the</p> <p>2 acoustic function signal.</p> <p>3 A. Acoustic condition.</p> <p>4 Q. Acoustic condition. Excuse me.</p> <p>5 Do you understand the acoustic condition</p> <p>6 to be a name for the Volkswagon cycle detection</p> <p>7 function?</p> <p>8 A. Yeah. And to be honest, my understanding</p> <p>9 is it was created by Bosch. So I wouldn't give --</p> <p>10 to Volkswagen, so it was the work of Bosch.</p> <p>11 Q. I'm sorry. You were moving paper on your</p> <p>12 microphone.</p> <p>13 A. My apologies. I believe the acoustic</p> <p>14 condition was created by Bosch, not Volkswagen.</p> <p>15 Q. You understand that another word for this</p> <p>16 acoustic condition is the acoustic function?</p> <p>17 A. I believe that is another word that we see</p> <p>18 used.</p> <p>19 Q. And the German name for that,</p> <p>20 Akustikfunktion, does that sound familiar to you?</p> <p>21 A. That sounds right, yeah. It's one word.</p> <p>22 Q. Did you look for the acoustic function in</p> <p>23 the software for the diesel Chevy Cruze?</p> <p>24 A. I don't remember. If I did, I didn't find</p> <p>25 it. No, I don't remember.</p>	<p style="text-align: right;">Page 132</p> <p>1 to find that it's not there, correct?</p> <p>2 A. I would think so, yeah.</p> <p>3 Q. Have you read the complaint in this case?</p> <p>4 A. No.</p> <p>5 Q. In the How They Did It article, you also</p> <p>6 describe what's called a defeat device in a Fiat</p> <p>7 vehicle?</p> <p>8 A. That's right.</p> <p>9 Q. If you turn to Page 9, you understand, and</p> <p>10 I think the paper says this, the Fiat 500X contain</p> <p>11 what amounts to a defeat device in the logic</p> <p>12 governing NSC regeneration. Do you recall that?</p> <p>13 A. That sounds right.</p> <p>14 Q. You're not opining that the diesel Cruze</p> <p>15 has the same defeat device in it as the Fiat 500X,</p> <p>16 right?</p> <p>17 A. Correct.</p> <p>18 Q. The article also describes a homologation</p> <p>19 demand block defeat device in the Fiat cars.</p> <p>20 It's not your opinion that the diesel</p> <p>21 Chevy Cruze has the homologation demand block</p> <p>22 defeat device that the Fiat cars had?</p> <p>23 A. I did not find that.</p> <p>24 Q. Did any of the alleged defeat devices that</p> <p>25 you identified in the software of the Fiat Chrysler</p>
<p style="text-align: right;">Page 131</p> <p>1 Q. Were you asked to look for the acoustic</p> <p>2 function in the diesel Chevy Cruze?</p> <p>3 A. I don't believe so.</p> <p>4 Q. In your opinion, would any reasonable</p> <p>5 investigation into the software of the diesel Chevy</p> <p>6 Cruze reveal that the acoustic function is used</p> <p>7 there?</p> <p>8 MR. SHAEFFER: Object to the form.</p> <p>9 THE WITNESS: I'm not entirely sure what you're</p> <p>10 asking.</p> <p>11 BY MR. WORK-DEMBOWSKI:</p> <p>12 Q. Well --</p> <p>13 A. Are you asking me if it's present?</p> <p>14 Q. If someone made a reasonable investigation</p> <p>15 into the software of the diesel Chevy Cruze, would</p> <p>16 they find the acoustic function?</p> <p>17 MR. SHAEFFER: Same objection.</p> <p>18 THE WITNESS: It would depend what they're</p> <p>19 looking for, but certainly if they were looking for</p> <p>20 something like this, they ought to be able to find</p> <p>21 it.</p> <p>22 BY MR. WORK-DEMBOWSKI:</p> <p>23 Q. If it were there?</p> <p>24 A. Yeah.</p> <p>25 Q. And if it's not there, they would be able</p>	<p style="text-align: right;">Page 133</p> <p>1 vehicles in the How They Did It paper appear in the</p> <p>2 software of the diesel Chevy Cruze?</p> <p>3 A. I did not -- I did not find them in the</p> <p>4 Chevy Cruze.</p> <p>5 Q. In this case, you had access to software</p> <p>6 documentation for the diesel Chevy Cruze vehicles,</p> <p>7 right?</p> <p>8 A. That's correct.</p> <p>9 Q. You also had access to A2L files?</p> <p>10 A. Yes.</p> <p>11 Q. In the How They Did It article, it's noted</p> <p>12 that having A2L files would significantly simplify</p> <p>13 the analysis; is that right?</p> <p>14 A. Yes.</p> <p>15 Q. And your analysis was made simpler in this</p> <p>16 case because you had access to those files,</p> <p>17 correct?</p> <p>18 A. That's correct.</p> <p>19 Q. Can you turn to Page 5, please. This is</p> <p>20 Page 5 in Exh bit 6. There are a couple of terms</p> <p>21 that appear on this page in a few places that I</p> <p>22 would like to ask you about.</p> <p>23 So first of all, in the left-hand column</p> <p>24 up at the top of the first sentence, there is a</p> <p>25 reference to function sheets making their way into</p>

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<p style="text-align: right;">Page 134</p> <p>1 something that's called the automobile performance 2 tuning community. 3 A. Uh-huh. Yes. 4 Q. Is automobile performance tuning 5 community, are those words that you put into the 6 article, or did somebody else write that? 7 A. I don't remember, but I agree with that 8 statement. 9 Q. Do you have an understanding of what the 10 automobile performance tuning community is? 11 A. Yes. 12 Q. What is it? 13 A. It's individuals who like to modify the 14 behavior of their vehicle by changing the software 15 because ultimately all of vehicle behavior or most 16 of it is based on software. So they modify the – 17 I generally believe only the calibration values to 18 change how the vehicle behaves. 19 Q. Is this a common practice? 20 A. I don't know how common it is. I know 21 there are people who do it. 22 Q. Is tuning legal? 23 MR. SHAEFFER: Object to – object to the form. 24 THE WITNESS: I don't know. That would be a 25 legal question.</p>	<p style="text-align: right;">Page 136</p> <p>1 BY MR. WORK-DEMBOWSKI: 2 Q. Are you aware of there being a tuning 3 community of Chevy Cruze diesel owners? 4 MR. SHAEFFER: Same objection. 5 THE WITNESS: I'm not aware of that. I haven't 6 looked for that. 7 BY MR. WORK-DEMBOWSKI: 8 Q. Are you aware of whether there are tuning 9 enthusiasts for Chevy Cruze diesel vehicles? 10 MR. SHAEFFER: Same objection. 11 THE WITNESS: I don't know anything about a – 12 what the – I should say I don't know if there is a 13 Chevy Cruze tuning community or what they do. I 14 did not look for that. 15 BY MR. WORK-DEMBOWSKI: 16 Q. Near the end of this article, you and your 17 coauthors wrote that tracking data flow – I'm 18 sorry. This is on Page 16 of the article, the left 19 column roughly across from references 8 and 9. 20 There's a sentence there that begins still 21 tracking. Still tracking the data flow in the code 22 and analyzing whether certain sensor conditions 23 influence the exhaust gas recirculation or other 24 subsystems related to emission control might enable 25 the detection of such passive devices.</p>
<p style="text-align: right;">Page 135</p> <p>1 BY MR. WORK-DEMBOWSKI: 2 Q. Is tuning common among diesel vehicle 3 owners? 4 A. Again, I'm sorry. I don't know how common 5 it is with which vehicles. 6 Q. Well, how does tuning affect vehicle 7 performance? 8 A. My understanding is that it depends on the 9 specific thing you're tuning, and there are 10 different ways people tune it. So I would assume 11 or at least from what I have seen increases 12 performance. 13 Q. And how does tuning affect emissions 14 performance? 15 A. Again – 16 MR. SHAEFFER: Object to the form. 17 THE WITNESS: – in a very general sense, some 18 tuning may make the vehicle perform worse with 19 respect to emissions, but I can't tell you that 20 that is true for all tuning. 21 BY MR. WORK-DEMBOWSKI: 22 Q. In your academic work on computer 23 security, have you looked into tuning? 24 MR. SHAEFFER: Object to the form. 25 THE WITNESS: Only in this article.</p>	<p style="text-align: right;">Page 137</p> <p>1 A. I'm sorry. Could you – could you tell 2 me where that – I'm not seeing it. Which 3 paragraph? 4 Q. It is the second paragraph in the left 5 column on Page 16. It begins about two-thirds of 6 the way down. It's across from the numbers 8 and 9 7 in the reference. 8 A. I see it. 9 Q. You see it now? Okay. 10 So this sentence talks about tracking data 11 flow related to EGR to enable the detection of 12 passive devices, and it says as part of future 13 work, we plan to study the viability of such an 14 approach and evaluate if we can detect Fiat's 15 defeat device in an automated manner. 16 Do you know if anyone did that planned 17 future work? 18 A. Not to my knowledge. 19 Q. But you did not do that planned future 20 work? 21 A. Not for the way it's described in using 22 data flow. 23 Q. Sitting here today, can you identify 24 anyone who has used or implemented the techniques 25 that you and your coauthors developed in the</p>

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<p style="text-align: right;">Page 138</p> <p>1 article that's Exh bit 6?</p> <p>2 A. I don't know who has applied the work. I</p> <p>3 would have to look at the citations of the article.</p> <p>4 MR. WORK-DEMBOWSKI: I'd like to just take a</p> <p>5 one-minute break, please.</p> <p>6 THE VIDEOGRAPHER: Okay. Going off the video</p> <p>7 record. The time is now 18:41 UTC.</p> <p>8 (Whereupon, a short break was</p> <p>9 taken.)</p> <p>10 THE VIDEOGRAPHER: We are back on the video</p> <p>11 record. The time is now 18:50 UTC. Go ahead.</p> <p>12 BY MR. WORK-DEMBOWSKI:</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 [REDACTED]</p> <p>17 [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 [REDACTED]</p>	<p style="text-align: right;">Page 140</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 [REDACTED]</p> <p>5 [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 [REDACTED]</p> <p>10 [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 [REDACTED]</p> <p>17 [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 [REDACTED]</p>
<p style="text-align: right;">Page 139</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 [REDACTED]</p> <p>5 [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 [REDACTED]</p> <p>10 [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 [REDACTED]</p> <p>17 [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 [REDACTED]</p>	<p style="text-align: right;">Page 141</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 [REDACTED]</p> <p>5 [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 [REDACTED]</p> <p>10 [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 [REDACTED]</p> <p>17 [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 [REDACTED]</p>

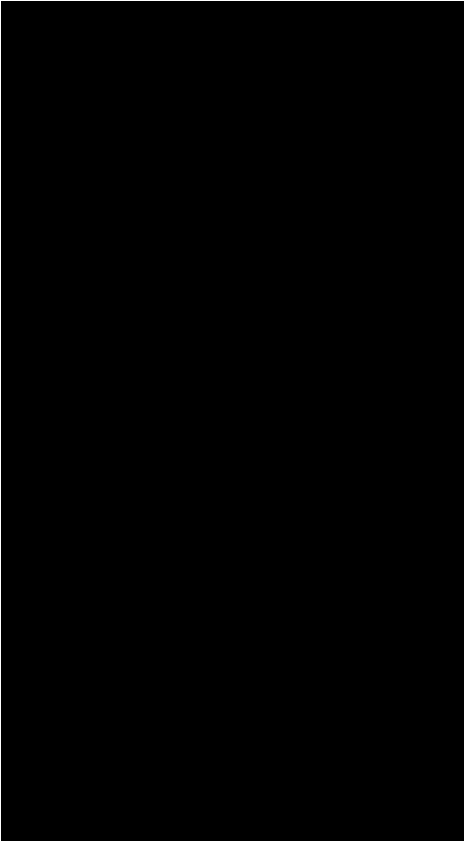
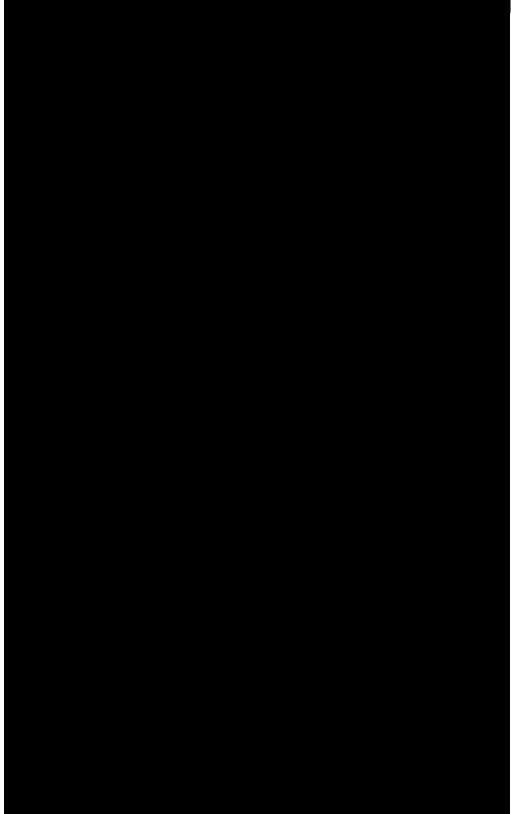
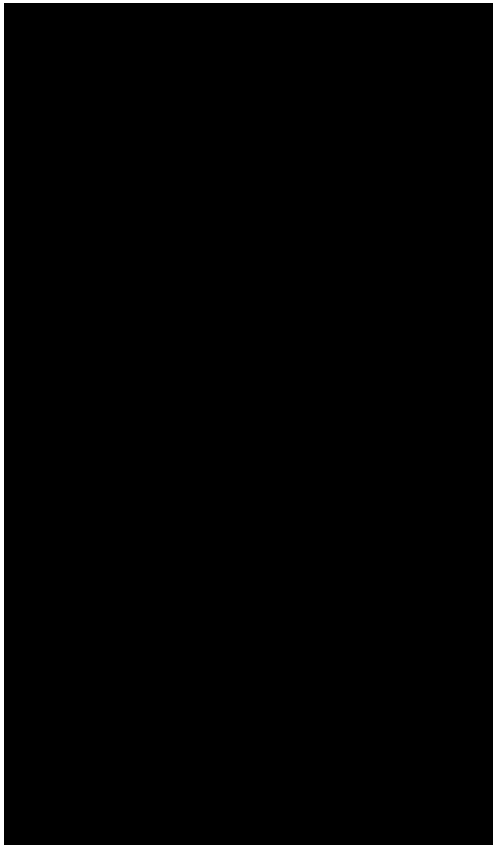
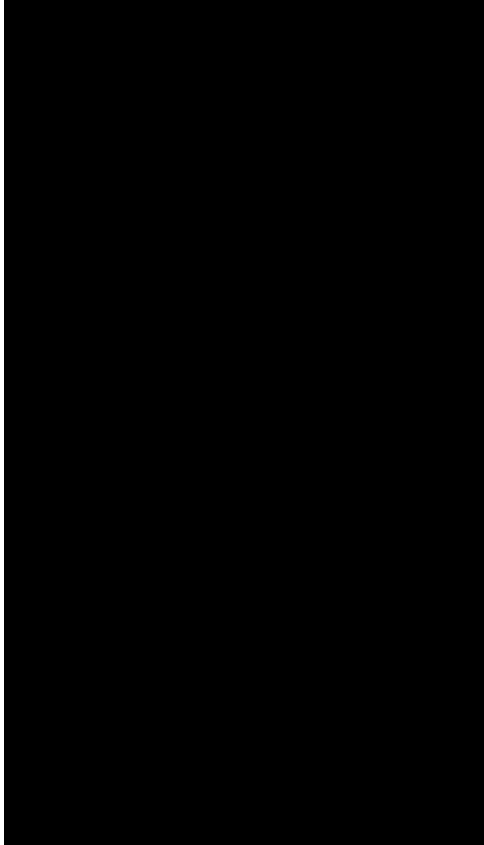
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<p>Page 174</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 [REDACTED]</p> <p>5 [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 [REDACTED]</p> <p>10 [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 [REDACTED]</p> <p>17 [REDACTED]</p> <p>18 [REDACTED]</p> <p>19 [REDACTED]</p> <p>20 [REDACTED]</p> <p>21 [REDACTED]</p> <p>22 [REDACTED]</p> <p>23 [REDACTED]</p> <p>24 [REDACTED]</p> <p>25 [REDACTED]</p>	<p>Page 176</p> <p>1 cycle beating mechanism?</p> <p>2 A. If a mechanism systematically provided</p> <p>3 better performance during a test, yes, I would.</p> <p>4 Q. Even if the difference that better</p> <p>5 performance makes no difference on whether the</p> <p>6 vehicle passes or fails the test?</p> <p>7 A. I think you've asked this question before,</p> <p>8 and so my answer is even if a mechanism does not by</p> <p>9 itself make the difference, if it helps the vehicle</p> <p>10 reduce emissions during a test, gives you different</p> <p>11 results during real-world driving, that could be a</p> <p>12 contributing factor to passing a test, and I would</p> <p>13 consider that in my definition to be cycle beating.</p> <p>14 Again, my definition is that it simply alters the</p> <p>15 performance during an emissions test to be more</p> <p>16 favorable.</p> <p>17 Q. What do you mean by a contributing factor</p> <p>18 to passing a test?</p> <p>19 A. I mean it would have an effect on</p> <p>20 emissions. So if you're testing for vehicle</p> <p>21 emissions and if the mechanism that you've added</p> <p>22 made the vehicle perform better with respect to</p> <p>23 emissions and this is a systematic thing, not just</p> <p>24 once in a particular test, then I would consider</p> <p>25 that to be something that fits my definition.</p>
<p>Page 175</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 [REDACTED]</p> <p>5 [REDACTED]</p> <p>6 [REDACTED]</p> <p>7 [REDACTED]</p> <p>8 [REDACTED]</p> <p>9 [REDACTED]</p> <p>10 [REDACTED]</p> <p>11 Q. Let's assume – so okay. Does your</p> <p>12 opinion that this is a cycle beating mechanism</p> <p>13 depend on the mere presence of a difference in</p> <p>14 behavior even if that difference in behavior did</p> <p>15 not make a significant change in the amount of NOx</p> <p>16 emitted?</p> <p>17 MR. SHAEFFER: Objection to form.</p> <p>18 THE WITNESS: I'm not sure what you mean by</p> <p>19 significant and all of these things. So you're</p> <p>20 asking a vague question.</p> <p>21 BY MR. WORK-DEMBOWSKI:</p> <p>22 Q. Let's assume hypothetically that the</p> <p>23 difference in behavior that you described results</p> <p>24 in a difference in tailpipe NOx emissions of 0.1</p> <p>25 milligrams. Would you still consider that to be a</p>	<p>Page 177</p> <p>1 Again, the definition is simply that it causes the</p> <p>2 vehicle to behave more favorably with respect to</p> <p>3 emissions during a test than it would otherwise.</p> <p>4 Q. Does your opinion that this is a cycle</p> <p>5 beating mechanism depend on there being no</p> <p>6 engineering justification for the change other than</p> <p>7 testing?</p> <p>8 A. My opinion is based on how the behavior</p> <p>9 manifests during a test versus other conditions.</p> <p>10 [REDACTED]</p> <p>11 [REDACTED]</p> <p>12 [REDACTED]</p> <p>13 [REDACTED]</p> <p>14 [REDACTED]</p> <p>15 [REDACTED]</p> <p>16 Q. But you have no information and no opinion</p> <p>17 as to whether this mechanism caused the diesel</p> <p>18 Cruze to be able to pass a test or not?</p> <p>19 A. I don't know what happened on any specific</p> <p>20 test that you may be referring to.</p> <p>21 Q. And your opinion would not change if the</p> <p>22 difference of NOx emissions was very small, was so</p> <p>23 small that it would not change whether the vehicle</p> <p>24 passed or failed a test; is that fair?</p> <p>25 MR. SHAEFFER: Object to the form.</p>

<p style="text-align: right;">Page 178</p> <p>1 THE WITNESS: So, you know, at some point, if 2 the mechanism has absolutely no effect, then, you 3 know, it doesn't have an effect on the cycle. Now, 4 at what point do you consider what amount you 5 consider to be statistically significant? That's 6 not something that's in my opinion. My opinion -- 7 BY MR. WORK-DEMBOWSKI: 8 Q. Well, you're the one who has defined a 9 cycle beating mechanism, and I'm trying to identify 10 what it is that you actually consider a cycle 11 beating mechanism. 12 If a -- all other things equal, if the 13 only difference is the operation or non-operation 14 of this mechanism and the vehicle still passes the 15 cycle, still passes the test, is that a cycle 16 beating mechanism -- 17 MR. SHAEFFER: Object to the form. 18 BY MR. WORK-DEMBOWSKI: 19 Q. -- under your definition? 20 A. So -- I'm sorry, Peter. Go ahead. 21 MR. SHAEFFER: I just want to -- Larry, you cut 22 off Dr. Levchenko for his last question. So I 23 would just ask that you let him finish his answer 24 before you ask your next question. 25</p>	<p style="text-align: right;">Page 180</p> <p>1 amount. My report doesn't talk about the exact 2 effect specifically on a -- on NOx emissions during 3 a particular driving scenario. The report does 4 talk about generally the effect of reducing it or 5 reducing EGR, increasing NOx emissions. I'm not 6 using in this definition a specific number or 7 amount. 8 Q. Cycle beating, the term cycle beating 9 refers to a cycle, and it also refers to beating. 10 If the cycle is not beaten, that is, if the 11 operation of the mechanism does not impact whether 12 the vehicle passes the cycle, do you still consider 13 it in your expert opinion to be cycle beating? 14 A. I would consider it such if it alters the 15 behaviors, again, systematically to produce lower 16 emissions during the cycle than under similar 17 circumstances. It's -- the definition that I'm 18 using does not talk specifically about passing or 19 specific NOx thresholds or anything like that. 20 Simply saying it reduces it in a systematic way 21 consistently on the test versus real driving. 22 Q. What do you mean by similar circumstances? 23 A. Circumstances that would have some of the 24 same parameters that except for the -- except for 25 the three factors I mention that contribute to --</p>
<p style="text-align: right;">Page 179</p> <p>1 BY MR. WORK-DEMBOWSKI: 2 Q. I certainly did not mean to interrupt you. 3 I apologize for that. 4 A. It's all right. So the definition that 5 I'm using in the report does not specify a 6 particular amount, and I think that's what you're 7 getting at. So the definition simply talks about 8 the fact that it does have a systemic effect. It's 9 not based on a specific number. 10 Q. I understand that answer. Let me -- let 11 me try the question a little differently. 12 A. Sure. 13 Q. Not in terms of a specific number, but in 14 terms of whether the mechanism operates to such an 15 extent that the vehicle would pass or fail with or 16 without the mechanism operating. So the operation 17 of the mechanism is the only thing that allows the 18 vehicle to pass the test. 19 A. Okay. And your question is whether that's 20 cycle beating by my definition? 21 Q. Yes. 22 A. Is that right? 23 Q. Yes. 24 A. So the definition, again, is just more 25 favorable performance. I don't quantify the exact</p>	<p style="text-align: right;">Page 181</p> <p>1 three factors that contribute to the cycle beating 2 device based on temperature. So this is 3 specifically the ones -- I'm looking through my 4 report. Let me find those, the low pass filtering, 5 remembered model temperature, vehicle speed, so 6 conditions that would not trigger those specific 7 behaviors, but are otherwise similar. 8 So what my report is saying is that the 9 combination of these specific conditions that I 10 talk about causes the vehicle to behave more 11 favorably than under conditions where these things 12 were not triggered. 13 Q. And if those conditions were all met while 14 a consumer was driving their vehicle on the road, 15 the behavior of the diesel Cruze would be exactly 16 the same, correct? 17 A. Under similar conditions, yes. These 18 conditions will -- can kick in during normal 19 driving as far as I know. 20 MR. SHAEFFER: Larry, you've been going for 21 about an hour. Are you at a good stopping point? 22 MR. WORK-DEMBOWSKI: Sure. Let's take a break 23 for five or 10. 24 THE VIDEOGRAPHER: Going off the video record. 25 The time is now 19:48 UTC.</p>

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<p style="text-align: right;">Page 182</p> <p>1 (Whereupon, a short break was 2 taken.) 3 THE VIDEOGRAPHER: We are back on the video 4 record. The time is now 20:00 UTC. Go ahead. 5 BY MR. WORK-DEMBOWSKI: 6 [REDACTED] 7 [REDACTED] 8 [REDACTED] 9 [REDACTED] 10 [REDACTED] 11 [REDACTED] 12 [REDACTED] 13 [REDACTED] 14 [REDACTED] 15 [REDACTED] 16 [REDACTED] 17 [REDACTED] 18 [REDACTED] 19 [REDACTED] 20 [REDACTED] 21 [REDACTED] 22 [REDACTED] 23 [REDACTED] 24 [REDACTED] 25 [REDACTED]</p>	<p style="text-align: right;">Page 184</p> <p>1 [REDACTED] 2 [REDACTED] 3 [REDACTED] 4 [REDACTED] 5 [REDACTED] 6 [REDACTED] 7 [REDACTED] 8 [REDACTED] 9 [REDACTED] 10 [REDACTED] 11 [REDACTED] 12 [REDACTED] 13 [REDACTED] 14 [REDACTED] 15 [REDACTED] 16 [REDACTED] 17 [REDACTED] 18 [REDACTED] 19 [REDACTED] 20 [REDACTED] 21 [REDACTED] 22 [REDACTED] 23 [REDACTED] 24 [REDACTED] 25 [REDACTED]</p>
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MR. WORK-DEMBOWSKI: I would like to take a break.

MR. SHAEFFER: That's fine with us. 10 minutes okay?

MR. WORK-DEMBOWSKI: I think 10 minutes is

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<p style="text-align: right;">Page 222</p> <p>1 perfect.</p> <p>2 THE VIDEOGRAPHER: Going off the video record.</p> <p>3 The time is now 21:00 UTC.</p> <p>4 (Whereupon, a short break was</p> <p>5 taken.)</p> <p>6 THE VIDEOGRAPHER: We're back on the video</p> <p>7 record. The time is now 21:15 UTC. Go ahead.</p> <p>8 BY MR. WORK-DEMBOWSKI:</p> <p>9 Q. Dr. Levchenko, are you familiar with</p> <p>10 something called an FTP 75 test?</p> <p>11 A. Yes.</p> <p>12 Q. FTP 75 test is an emissions test that's</p> <p>13 conducted on a chassis dynamometer, correct?</p> <p>14 A. That's my understanding.</p> <p>15 Q. And it consists of a specified set of</p> <p>16 parameters and driving curve that's supposed to be</p> <p>17 conducted, and emissions measurements are taken.</p> <p>18 Is that your understanding?</p> <p>19 A. That is.</p> <p>20 Q. I'd like to pose a hypothetical. I'd like</p> <p>21 you to assume that someone took a 2015 diesel Chevy</p> <p>22 Cruze and put it through a fully proper and</p> <p>23 compliant FTP 75 test. That is to say the test</p> <p>24 meets all the regulatory requirements for</p> <p>25 temperature settings on the dynamometer,</p>	<p style="text-align: right;">Page 224</p> <p>1 specific vehicle would fail this test. A lot of</p> <p>2 different factors that could go into it. So I</p> <p>3 certainly – so my report or really no report could</p> <p>4 answer the question about this specific instance.</p> <p>5 BY MR. WORK-DEMBOWSKI:</p> <p>6 Q. Would any of the software mechanisms</p> <p>7 described in your report explain that kind of a</p> <p>8 failure on an FTP 75 test?</p> <p>9 MR. SHAEFFER: Object to the form.</p> <p>10 THE WITNESS: The mechanisms I described</p> <p>11 could – could be the cause, but again, it would</p> <p>12 have to depend on the specific test. I mean, the</p> <p>13 mechanisms I describe would cause increased NOx</p> <p>14 emissions under various conditions, which I outline</p> <p>15 in my report. A particular vehicle failing a test</p> <p>16 is a lot to do with the vehicle.</p> <p>17 BY MR. WORK-DEMBOWSKI:</p> <p>18 Q. The software mechanisms addressed in your</p> <p>19 report all existed in the diesel Chevy Cruze</p> <p>20 vehicles that were used for certification testing</p> <p>21 by General Motors, correct?</p> <p>22 A. I believe they were used in production</p> <p>23 here because that's what was represented to me. I</p> <p>24 assumed those are also the vehicles tested, but I'm</p> <p>25 not sure of the exact testing process.</p>
<p style="text-align: right;">Page 223</p> <p>1 preconditioning, everything done according to spec.</p> <p>2 Do you understand that hypothetical?</p> <p>3 A. Yes.</p> <p>4 Q. Now, assuming that the vehicle fails the</p> <p>5 test, fails the FTP 75 test in terms of producing</p> <p>6 more NOx emissions than are provided for under the</p> <p>7 federal FTP 75 standard, do you understand that</p> <p>8 part of the hypothetical?</p> <p>9 A. I don't know the exact amount that would</p> <p>10 be involved, but I understand your hypothetical</p> <p>11 generally.</p> <p>12 MR. SHAEFFER: I just want to object to the</p> <p>13 form of the question.</p> <p>14 BY MR. WORK-DEMBOWSKI:</p> <p>15 Q. So the hypothetical is that the diesel</p> <p>16 Chevy Cruze undergoes an FTP 75 test and generates</p> <p>17 a higher amount of NOx emissions than are provided</p> <p>18 for under the federal FTP 75 standard.</p> <p>19 My question for you, Dr. Levchenko, is</p> <p>20 whether anything in your analysis in this case</p> <p>21 could explain the reason why such a vehicle would</p> <p>22 fail the FTP 75 test?</p> <p>23 MR. SHAEFFER: Object to the form.</p> <p>24 THE WITNESS: Again, this is a question that</p> <p>25 has a lot of details. I don't know why that</p>	<p style="text-align: right;">Page 225</p> <p>1 Q. Do you have any reason to believe that the</p> <p>2 software mechanisms were not present in the</p> <p>3 vehicles that General Motors used for certification</p> <p>4 testing?</p> <p>5 A. I have no reason to believe that.</p> <p>6 Q. Now, assume, you can just assume this,</p> <p>7 that when General Motors conducted FTP 75 testing</p> <p>8 for certification of the diesel Cruze vehicles,</p> <p>9 they all passed by significant margin. Do you</p> <p>10 understand that?</p> <p>11 A. I understand.</p> <p>12 Q. Can you accept it as a hypothetical if</p> <p>13 that helps?</p> <p>14 A. Yeah.</p> <p>15 MR. SHAEFFER: Object to the form.</p> <p>16 BY MR. WORK-DEMBOWSKI:</p> <p>17 Q. And so I'll ask again do any of software</p> <p>18 mechanisms addressed in your reports explain why</p> <p>19 another diesel Cruze vehicle would fail a similar</p> <p>20 FTP 75 test?</p> <p>21 MR. SHAEFFER: Objection to form.</p> <p>22 THE WITNESS: Yeah. I mean, just to be clear,</p> <p>23 a vehicle can pass. It can also fail for lots of</p> <p>24 different reasons. It could be that the mechanisms</p> <p>25 might have been involved. It could be a defect. I</p>

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<p style="text-align: right;">Page 226</p> <p>1 don't know. I couldn't tell you why a specific</p> <p>2 vehicle would or would not. It certainly could</p> <p>3 contribute to it.</p> <p>4 BY MR. WORK-DEMBOWSKI:</p> <p>5 Q. Are you saying that the mechanisms</p> <p>6 described in your reports could contribute to</p> <p>7 higher NOx emissions during an FTP 75 test?</p> <p>8 A. I – I did not analyze the FTP 75, but in</p> <p>9 general, the mechanisms alter the behavior of the</p> <p>10 vehicle with respect to emissions mechanisms. The</p> <p>11 analysis takes about SC03. I did not consider how</p> <p>12 it would behave on the FTP 75. So I don't have an</p> <p>13 answer to that.</p> <p>14 MR. WORK-DEMBOWSKI: At this time I'm ready to</p> <p>15 pass the witness to General Motors. I'd like to</p> <p>16 reserve the right to ask follow-up questions if</p> <p>17 needed.</p> <p>18 MS. SMITH: Thank you. This is Renee Smith</p> <p>19 representing General Motors. If we could take</p> <p>20 maybe a – go off the record for a moment, I would</p> <p>21 appreciate it.</p> <p>22 MR. SHAEFFER: Sure.</p> <p>23 THE VIDEOGRAPHER: Going off the video record.</p> <p>24 The time is now 21:22.</p> <p>25</p>	<p style="text-align: right;">Page 228</p> <p>1 but obviously, just the software aspects of it.</p> <p>2 Q. Several times during this deposition when</p> <p>3 you said that, it's really a question for an</p> <p>4 automotive engineer, correct?</p> <p>5 A. Yeah.</p> <p>6 Q. And in your expert report, Exh bit 1, you</p> <p>7 discussed two potential cycle beating strategies,</p> <p>8 which we talked about throughout the day, but just</p> <p>9 so you have it in front of you, two potential cycle</p> <p>10 beating strategies, and this is paragraph 1.</p> <p>11 A. Okay.</p> <p>12 Q. And you described the cycle beating</p> <p>13 strategies as potential cycle beating strategies;</p> <p>14 is that correct?</p> <p>15 A. That's correct.</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>
<p style="text-align: right;">Page 227</p> <p>1 (Whereupon, a short break was</p> <p>2 taken.)</p> <p>3 THE VIDEOGRAPHER: We're back on the video</p> <p>4 record. The time is now 21:46 UTC. Go ahead.</p> <p>5 MS. SMITH: Good afternoon Dr. Levchenko. We</p> <p>6 talked a little bit earlier, but my name is Renee</p> <p>7 Smith, and I represent General Motors LLC. I just</p> <p>8 have a few additional questions for you.</p> <p>9 EXAMINATION</p> <p>10 BY MS. SMITH:</p> <p>11 Q. You have a Ph.D. in computer science and</p> <p>12 engineering from the University of California,</p> <p>13 correct?</p> <p>14 A. Yes.</p> <p>15 Q. And I believe several times throughout</p> <p>16 this deposition, you said your focus is on the</p> <p>17 software analysis, correct?</p> <p>18 A. That's correct.</p> <p>19 Q. You're not an automotive engineer,</p> <p>20 correct?</p> <p>21 A. I'm not an automotive engineer.</p> <p>22 Q. And you're not offering opinions about</p> <p>23 automotive engineering, correct?</p> <p>24 A. Well, to the extent that the opinions I</p> <p>25 offer are about automotive engineering, they are,</p>	<p style="text-align: right;">Page 229</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>

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<p>Page 230</p> <p>1 [REDACTED]</p> <p>2 [REDACTED]</p> <p>3 [REDACTED]</p> <p>4 Q. And you're not opining that General Motors</p> <p>5 intended to use either of these as a cycle beating</p> <p>6 strategy, are you?</p> <p>7 A. I – I don't know what the role of General</p> <p>8 Motors is exactly. I don't know what General</p> <p>9 Motors's intent was.</p> <p>10 Q. And you're not offering an opinion that if</p> <p>11 there were any cycle beating strategies that</p> <p>12 General Motors even knew about it, correct?</p> <p>13 MR. SHAEFFER: Object to the form.</p> <p>14 THE WITNESS: My opinion does not discuss what</p> <p>15 GM knew or did not know.</p> <p>16 BY MS. SMITH:</p> <p>17 Q. You haven't read a single deposition of</p> <p>18 any engineer from GM, have you?</p> <p>19 A. That's correct.</p> <p>20 Q. You haven't read a single deposition of</p> <p>21 any former or current GM employee, correct?</p> <p>22 A. Correct.</p> <p>23 Q. If we could please turn to Exh bit 6,</p> <p>24 which is your article.</p> <p>25 A. Okay.</p>	<p>Page 232</p> <p>1 you are a coauthor, it states meeting modern</p> <p>2 emissions standards is one of the main challenges</p> <p>3 faced by car manufacturers as emissions standards</p> <p>4 become more stringent. Did I read that correctly?</p> <p>5 A. Yes.</p> <p>6 Q. And is that a true and accurate statement</p> <p>7 that meeting modern emissions standards is one of</p> <p>8 the main challenges faced by car manufacturers?</p> <p>9 A. I would not – I would not say that with</p> <p>10 absolute certainty. This is an introductory</p> <p>11 paragraph to give the reader a general sense. I</p> <p>12 think in a more technical sense, I don't know what</p> <p>13 exactly is the main challenge faced by auto makers.</p> <p>14 Q. Would you agree that the sentence that</p> <p>15 emissions standards have become more stringent is</p> <p>16 accurate?</p> <p>17 A. That's my understanding.</p> <p>18 Q. And if you – also, on Exh bit 6, Page 3,</p> <p>19 if you could please go to that.</p> <p>20 A. Yeah.</p> <p>21 Q. And in the right-hand column under</p> <p>22 subheading B, emission test cycles and emission</p> <p>23 standards, do you have that?</p> <p>24 A. Yes.</p> <p>25 Q. The first sentence states an emission test</p>
<p>Page 231</p> <p>1 Q. The article is How They Did It: An</p> <p>2 Analysis of Emissions Defeat Devices in Modern</p> <p>3 Automobiles, correct?</p> <p>4 A. Yes.</p> <p>5 Q. That's an exh bit that you discussed with</p> <p>6 counsel for Robert Bosch LLC earlier today,</p> <p>7 correct?</p> <p>8 A. Yes.</p> <p>9 Q. And in the abstract in Exh bit 6, the very</p> <p>10 first line says modern vehicles are required to</p> <p>11 comply with a range of environmental regulations</p> <p>12 limiting the level of emissions for various</p> <p>13 greenhouse gases, toxins and particulate matter,</p> <p>14 correct?</p> <p>15 A. Yes.</p> <p>16 Q. And that's accurate, correct?</p> <p>17 A. That's my understanding, yes.</p> <p>18 Q. And if you – Exh bit 6 on the first page,</p> <p>19 the second column to the right, the second full</p> <p>20 paragraph –</p> <p>21 A. I'm sorry.</p> <p>22 Q. I'm sorry. The second full paragraph in</p> <p>23 the right-hand column.</p> <p>24 A. Okay.</p> <p>25 Q. In that paragraph in the article on which</p>	<p>Page 233</p> <p>1 cycle defines a protocol that enables repeatable</p> <p>2 and comparable measurements of exhaust emissions to</p> <p>3 evaluate emission compliance. Did I read that</p> <p>4 correctly?</p> <p>5 A. Yes.</p> <p>6 Q. And why is it important that there be</p> <p>7 repeatable measurements of exhaust emissions?</p> <p>8 MR. SHAEFFER: Object to the form.</p> <p>9 THE WITNESS: I think generally as an</p> <p>10 engineering principle, you want people to be able</p> <p>11 to perform the test independently and specifically</p> <p>12 for auto manufacturers to be able to do the test,</p> <p>13 but I don't know the exact rationale that went into</p> <p>14 the rule making.</p> <p>15 BY MS. SMITH:</p> <p>16 Q. Is it fair to say that you – just as an</p> <p>17 engineer, that it's very important to have things</p> <p>18 be repeatable; is that correct?</p> <p>19 A. As a general principle, yes.</p> <p>20 Q. And is it correct that that goes to</p> <p>21 whether a test result is reliable?</p> <p>22 MR. SHAEFFER: Object to the form.</p> <p>23 THE WITNESS: I hesitate to characterize</p> <p>24 something as not reliable because it couldn't be</p> <p>25 repeated, but – so I wouldn't characterize an</p>

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<p style="text-align: right;">Page 234</p> <p>1 emissions test as unreliable if there was a</p> <p>2 difficulty repeating them.</p> <p>3 BY MS. SMITH:</p> <p>4 Q. And I apologize. I was unclear. I wasn't</p> <p>5 speaking in terms of emissions tests, just as a</p> <p>6 general principle of science and engineering.</p> <p>7 For – one of the factors that could be considered</p> <p>8 in reliability is whether something is repeatable,</p> <p>9 correct?</p> <p>10 A. Yeah, that's probably fair to say. Again,</p> <p>11 this is just very general terms.</p> <p>12 Q. Right. Science 101, right?</p> <p>13 MR. SHAEFFER: Object to the form. You can</p> <p>14 answer.</p> <p>15 THE WITNESS: Oh, yeah. I mean, repeatability</p> <p>16 of experiments is a desirable property in science</p> <p>17 and engineering.</p> <p>18 BY MS. SMITH:</p> <p>19 Q. And you were asked a number of questions</p> <p>20 about defeat device. I'm sure you recall those</p> <p>21 questions, some of them; is that correct?</p> <p>22 A. Yes.</p> <p>23 Q. And you testified that defeat – you are</p> <p>24 not using a precise legal meaning when you discuss</p> <p>25 defeat device; is that correct?</p>	<p style="text-align: right;">Page 236</p> <p>1 right, but that is – that's what it says.</p> <p>2 Q. And what is the European Research Council,</p> <p>3 if you know?</p> <p>4 A. I do not. Those acknowledgments are from</p> <p>5 my German colleagues.</p> <p>6 Q. Do you know what the National Science</p> <p>7 Foundation is?</p> <p>8 A. Sorry. That acknowledgment is mine. The</p> <p>9 European ones are theirs.</p> <p>10 Q. And what is the National Science</p> <p>11 Foundation?</p> <p>12 A. It's a government entity, which, in this</p> <p>13 particular case, awards research funding to</p> <p>14 universities and researchers like myself.</p> <p>15 Q. And that was one of the funders of the</p> <p>16 article that is marked as Exhibit 6, correct?</p> <p>17 A. Of the work, yeah.</p> <p>18 Q. And the reports that you did in this</p> <p>19 litigation were not funded by any foundations; is</p> <p>20 that correct?</p> <p>21 A. That's correct.</p> <p>22 Q. They were funded by lawyers, correct?</p> <p>23 A. I'm paid for by the law firms, yeah.</p> <p>24 Q. And in article 6, which was funded by</p> <p>25 these foundations, there's the definition at</p>
<p style="text-align: right;">Page 235</p> <p>1 A. That's correct.</p> <p>2 Q. Because you're not a lawyer, correct?</p> <p>3 A. I'm not a lawyer.</p> <p>4 Q. If we could look at Exhibit 6, which is</p> <p>5 your article again, please. That article does use</p> <p>6 a precise definition for defeat device, correct?</p> <p>7 A. It cites the precise definition. I</p> <p>8 wouldn't characterize the article as meeting all of</p> <p>9 the legal requirements that you would for defeat</p> <p>10 device. So we cite the definition, but we're,</p> <p>11 obviously, not lawyers. So we're using it in a</p> <p>12 general understanding.</p> <p>13 Q. Exhibit 6 was – if you turn to Page 16 of</p> <p>14 Exhibit 6, which is your article, could you please</p> <p>15 turn to the section that says acknowledgments? Do</p> <p>16 you have that in front of you?</p> <p>17 A. Yes.</p> <p>18 Q. It says part of this work was supported by</p> <p>19 European Research Council, ERC, under the European</p> <p>20 Union's Horizon 2020 research and innovation</p> <p>21 programme, Grant Agreement No. 64011-Bastion and</p> <p>22 that this work was funded, in part, by the National</p> <p>23 Science Foundation through grant NSF-1646493; is</p> <p>24 that correct?</p> <p>25 A. I don't know if the numbers are exactly</p>	<p style="text-align: right;">Page 237</p> <p>1 Page 1, the left-hand column. At the heart of the</p> <p>2 scandal is Volkswagen's use of a defeat device,</p> <p>3 defined by the EPA is any device that reduces the</p> <p>4 effectiveness of the emission control system under</p> <p>5 conditions which may reasonably be expected to be</p> <p>6 encountered in normal vehicle operation and use</p> <p>7 with exceptions for starting engine, emergency</p> <p>8 vehicles and to prevent accidents; is that correct?</p> <p>9 A. I'm sorry. Where – where are you reading</p> <p>10 that from?</p> <p>11 Q. I apologize. It's Page 1 under the</p> <p>12 introduction.</p> <p>13 A. Yeah.</p> <p>14 Q. The second paragraph.</p> <p>15 A. Okay. Yeah, I see it.</p> <p>16 Q. And do you see that in the second</p> <p>17 paragraph, there's a definition of defeat device</p> <p>18 that is defined by the EPA; is that correct?</p> <p>19 A. It's a fragment of the definition. It's</p> <p>20 not the entire definition.</p> <p>21 Q. Exactly. So if we turn to Page 5 of</p> <p>22 Exhibit 6. And Page 5 of Exhibit 6 under Roman</p> <p>23 Numeral IV, do you see defeat devices?</p> <p>24 A. Yes.</p> <p>25 Q. And I believe you told counsel for Robert</p>

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<p style="text-align: right;">Page 238</p> <p>1 Bosch LLC that Section 4 was one of the sections</p> <p>2 that you personally worked on for this paper; is</p> <p>3 that correct?</p> <p>4 A. Yes.</p> <p>5 Q. And in Section 4, there is a precise</p> <p>6 definition, and that's at footnote 1; is that</p> <p>7 correct?</p> <p>8 A. I don't know whether that's the complete</p> <p>9 definition, but it's, I believe, part of the full</p> <p>10 definition.</p> <p>11 Q. And in this article, which was funded by</p> <p>12 foundations, this article states more precisely,</p> <p>13 the U.S. Code of Federal Regulations defines a</p> <p>14 defeat device as an auxiliary emission control</p> <p>15 device, an AECD, that reduces the effectiveness of</p> <p>16 the emission control system under conditions which</p> <p>17 reasonably may be expected to be encountered in</p> <p>18 normal vehicle operation and use unless, one, such</p> <p>19 conditions are substantially included in the</p> <p>20 federal emission test procedure; two, the need for</p> <p>21 the AECD is justified in terms of protecting the</p> <p>22 vehicle against damage or accident; three, the AECD</p> <p>23 does not go beyond the requirements of engine</p> <p>24 starting; or four, the AECD applies only for</p> <p>25 emergency vehicles. Did I read that correctly?</p>	<p style="text-align: right;">Page 240</p> <p>1 emissions than the test under otherwise similar</p> <p>2 circumstances.</p> <p>3 So I believe that some of that meaning is</p> <p>4 included in the AECD definition, but again, I'm not</p> <p>5 here to try to interpret the legal definition of</p> <p>6 the AECD.</p> <p>7 BY MS. SMITH:</p> <p>8 Q. And you also are not offering an opinion</p> <p>9 as to whether or not the conditions that you point</p> <p>10 out are or are not substantially included in the</p> <p>11 federal emission test procedure, right? That's</p> <p>12 just not part of your opinion, correct?</p> <p>13 A. I certainly don't use those terms.</p> <p>14 Q. And likewise, you don't offer an opinion</p> <p>15 as to whether the need for the AECD or other</p> <p>16 condition is justified in terms of protecting the</p> <p>17 vehicle against damage or accident, correct?</p> <p>18 A. I do not offer that opinion.</p> <p>19 Q. Have you reached an opinion on whether any</p> <p>20 of these conditions are justified in terms of</p> <p>21 protecting the vehicle against damage or accidents?</p> <p>22 A. No.</p> <p>23 Q. And in fact, you would not be qualified to</p> <p>24 do so, correct?</p> <p>25 MR. SHAEFFER: Object to the form.</p>
<p style="text-align: right;">Page 239</p> <p>1 A. Yes.</p> <p>2 Q. And is that the more precise definition</p> <p>3 that was included in the article you coauthored at</p> <p>4 Exh bit 6?</p> <p>5 A. I believe so, yes.</p> <p>6 Q. And when you made opinions regarding</p> <p>7 potential cycle beaters, did you determine whether</p> <p>8 those conditions were substantially included in the</p> <p>9 federal emission test procedure?</p> <p>10 A. So my report does not talk about that. I</p> <p>11 do talk about the SC03, but it doesn't talk about</p> <p>12 the other tests.</p> <p>13 Q. So you have not -- you have not offered an</p> <p>14 opinion as to whether the conditions that you have</p> <p>15 described as potential cycle beaters are</p> <p>16 substantially included in a federal emission test</p> <p>17 procedure, correct?</p> <p>18 MR. SHAEFFER: Objection. Asked and answered.</p> <p>19 THE WITNESS: So let me -- let me look</p> <p>20 carefully at the exact wording. I want to make</p> <p>21 sure I answer your question correctly. So the</p> <p>22 conclusion with respect to SC03 that's in the</p> <p>23 report, obviously, talks about an emissions test,</p> <p>24 and it says that during the high-temperature</p> <p>25 emissions test, the vehicle will produce lower</p>	<p style="text-align: right;">Page 241</p> <p>1 THE WITNESS: I'm not sure what the exact</p> <p>2 question you're asking is. Certainly some of the</p> <p>3 analysis that I'm doing could be used to answer</p> <p>4 that question, but I'm not qualified to make a</p> <p>5 legal determination with respect to that particular</p> <p>6 point.</p> <p>7 BY MS. SMITH:</p> <p>8 Q. Let me clarify. I'm not asking legal. I</p> <p>9 just want to know from an automotive engineering</p> <p>10 perspective, would you be qualified to opine on</p> <p>11 whether these conditions are justified in terms of</p> <p>12 protecting the vehicle against damage or accident?</p> <p>13 A. I would agree with that.</p> <p>14 Q. You're not qualified; is that correct?</p> <p>15 A. Yeah. It would require consideration of</p> <p>16 factors that are outside of my report and outside</p> <p>17 of what I'm -- what my analysis is about.</p> <p>18 Q. And you also didn't determine, in forming</p> <p>19 your opinions regarding these potential cycle</p> <p>20 beating conditions, whether the AECD goes beyond</p> <p>21 the requirements of engine starting, did you?</p> <p>22 A. That was not an opinion I offered.</p> <p>23 Q. And you did not do an analysis to</p> <p>24 determine if, in fact, the conditions went beyond</p> <p>25 the requirements of engine starting, correct?</p>

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<p style="text-align: right;">Page 242</p> <p>1 A. That's correct.</p> <p>2 Q. Have you reviewed General Motors's AECD</p> <p>3 submission for the 2014 or 2015 Chevrolet Cruze</p> <p>4 diesel vehicles?</p> <p>5 A. I've read parts of it.</p> <p>6 Q. You're not offering an opinion that those</p> <p>7 disclosures are inaccurate, are you?</p> <p>8 A. Again, I think that would be more of a</p> <p>9 legal opinion about what would be considered an</p> <p>10 accurate disclosure or not. I will say that with</p> <p>11 respect, again, to my findings with respect to the</p> <p>12 outside air temperature, I don't believe that – I</p> <p>13 don't recall the disclosures describing exactly how</p> <p>14 the modeled air temperature is manipulated.</p> <p>15 Q. As you sit here today, is there anything</p> <p>16 in those AECD disclosures that you opine is not</p> <p>17 accurate?</p> <p>18 A. I don't offer an opinion on the accuracy</p> <p>19 of the AECDs. However, the opinion I do offer may</p> <p>20 have bearing on the accuracy of those.</p> <p>21 Q. But you will not – I just want to get the</p> <p>22 answer to this one question.</p> <p>23 You will not be offering an opinion that</p> <p>24 anything in General Motors's AECD disclosures for</p> <p>25 the 2014, 2015 model year Chevy Cruze diesel</p>	<p style="text-align: right;">Page 244</p> <p>1 A. I have no reason – I have no basis to</p> <p>2 conclude one way or another.</p> <p>3 MS. SMITH: Could we go off the record for just</p> <p>4 one moment? I want to make sure I'm done, but if</p> <p>5 you can give me one second.</p> <p>6 MR. SHAEFFER: Sure.</p> <p>7 THE VIDEOGRAPHER: Going off the video record.</p> <p>8 The time is now 22:08.</p> <p>9 (Whereupon, a short break was</p> <p>10 taken.)</p> <p>11 THE VIDEOGRAPHER: We are back on the video</p> <p>12 record. The time is now 22:09.</p> <p>13 MS. SMITH: Dr. Levchenko, thank you for the</p> <p>14 time this afternoon. I don't have any more</p> <p>15 questions at this time. Thank you.</p> <p>16 MR. SHAEFFER: And I would just like to go off</p> <p>17 the record for just a couple minutes, and Kirill,</p> <p>18 if you want to get to our breakout room.</p> <p>19 THE VIDEOGRAPHER: Going off the video record.</p> <p>20 The time is now 22:10.</p> <p>21 (Whereupon, a short break was</p> <p>22 taken.)</p> <p>23 THE VIDEOGRAPHER: Back on the video record.</p> <p>24 The time is now 22:14 UTC. Go ahead.</p> <p>25 MR. SHAEFFER: So we don't have any questions</p>
<p style="text-align: right;">Page 243</p> <p>1 vehicles were inaccurate?</p> <p>2 MR. SHAEFFER: Objection. Asked and answered.</p> <p>3 THE WITNESS: Again, I'm not offering an</p> <p>4 opinion on the legal matter of whether there were</p> <p>5 inaccuracies in it; however, my findings do have</p> <p>6 implications on the accuracy of the disclosures.</p> <p>7 BY MS. SMITH:</p> <p>8 Q. Dr. Levchenko, this will be so close –</p> <p>9 this will be over so fast if you can say are you</p> <p>10 going to be offering an opinion that anything in</p> <p>11 General Motors's AECD disclosures is inaccurate?</p> <p>12 Will you be offering that specific opinion?</p> <p>13 MR. SHAEFFER: Same objection.</p> <p>14 THE WITNESS: Not that specific opinion, but</p> <p>15 again, I do want to emphasize that the opinion I do</p> <p>16 offer does have implications for the accuracy of</p> <p>17 the disclosures.</p> <p>18 BY MS. SMITH:</p> <p>19 Q. Okay. You testified about Exh bit 7 quite</p> <p>20 a bit, which is the [REDACTED] e-mail. Do you</p> <p>21 recall being asked about that e-mail?</p> <p>22 A. Yes.</p> <p>23 Q. And do you have any reason to believe that</p> <p>24 anyone from General Motors ever saw or received</p> <p>25 that e-mail before this litigation?</p>	<p style="text-align: right;">Page 245</p> <p>1 for Dr. Levchenko.</p> <p>2 MR. WORK-DEMBOWSKI: I don't have any further</p> <p>3 questions, Dr. Levchenko. Thank you for your time</p> <p>4 today.</p> <p>5 MS. SMITH: Thank you so much.</p> <p>6 MR. SHAEFFER: And we're going to reserve our</p> <p>7 signature on the transcript.</p> <p>8 MS. SMITH: Thank you.</p> <p>9 THE VIDEOGRAPHER: Anything else before we go</p> <p>10 off the video record?</p> <p>11 MR. SHAEFFER: I don't believe so.</p> <p>12 MS. SMITH: No.</p> <p>13 THE VIDEOGRAPHER: Going off the video record.</p> <p>14 The time is now 22:14.</p> <p>15 (FURTHER DEPONENT SAITH NAUGHT.)</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>

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<p style="text-align: right;">Page 246</p> <p>1 UNITED STATES DISTRICT COURT</p> <p>2 FOR THE EASTERN DISTRICT OF MICHIGAN</p> <p>3 JASON COUNTS, et al.,)</p> <p>4 individually, and on behalf)</p> <p>5 of THEMSELVES AND ALL) C.A. No.</p> <p>6 OTHERS similarly situated,) 1:16-cv-12541-TLL-PTM</p> <p>7 Plaintiffs,)</p> <p>8 vs.)</p> <p>9 GENERAL MOTORS LLC, ROBERT)</p> <p>10 BOSCH GMBH, and ROBERT)</p> <p>11 BOSCH LLC,)</p> <p>12 Defendants.)</p> <p>13 I, KIRILL LEVCHENKO, Ph.D., being first</p> <p>14 duly sworn, on oath say that I am the deponent in</p> <p>15 the aforesaid deposition taken on May 19, 2020;</p> <p>16 that I have read the foregoing transcript of my</p> <p>17 deposition, consisting of pages 1 through 245</p> <p>18 inclusive, and affix my signature to same.</p> <p>19 _____</p> <p style="text-align: center;">KIRILL LEVCHENKO, Ph.D.</p> <p>20</p> <p>21 Subscribed and sworn to</p> <p>22 before me this _____ day</p> <p>23 of _____, 2020</p> <p>24 _____</p> <p>25 Notary Public</p>	<p style="text-align: right;">Page 248</p> <p>1 I further certify that the taking of this</p> <p>2 deposition was pursuant to notice and that there</p> <p>3 were present at the deposition the attorneys</p> <p>4 hereinbefore mentioned.</p> <p>5 I further certify that I am not counsel</p> <p>6 for nor in any way related to the parties to this</p> <p>7 suit, nor am I in any way interested in the outcome</p> <p>8 thereof.</p> <p>9 IN TESTIMONY WHEREOF: I have hereunto set</p> <p>10 my hand and affixed my notarial seal this 29th day</p> <p>11 of May, 2020.</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16 _____</p> <p>17 NOTARY PUBLIC, COOK COUNTY, ILLINOIS</p> <p>18 LIC. NO. 084-004143</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>
<p style="text-align: right;">Page 247</p> <p>1 STATE OF ILLINOIS)</p> <p>2) SS:</p> <p>3 COUNTY OF COOK)</p> <p>4 I, GINA M. LUORDO, a notary public within</p> <p>5 and for the County of Cook County and State of</p> <p>6 Illinois, do hereby certify that heretofore,</p> <p>7 to-wit, on May 19, 2020, remotely appeared before</p> <p>8 me KIRILL LEVCHENKO, Ph.D., in a cause now pending</p> <p>9 and undetermined in the United States District</p> <p>10 Court, Eastern District of Michigan wherein JASON</p> <p>11 COUNTS, et al. are the Plaintiffs, and GENERAL</p> <p>12 MOTORS LLC, et al. are the Defendants.</p> <p>13 I further certify that the said KIRILL</p> <p>14 LEVCHENKO, Ph.D. was first duly sworn to testify</p> <p>15 the truth, the whole truth and nothing but the</p> <p>16 truth in the cause aforesaid; that the testimony</p> <p>17 then given by said witness was reported</p> <p>18 stenographically by me in the presence of the said</p> <p>19 witness, and afterwards reduced to typewriting by</p> <p>20 Computer-Aided Transcription, and the foregoing is</p> <p>21 a true and correct transcript of the testimony so</p> <p>22 given by said witness as aforesaid.</p> <p>23 I further certify that the signature to</p> <p>24 the foregoing deposition was not waived by counsel</p> <p>25 for the respective parties.</p>	